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SCIENCE AND TECHNOLOGY POLICY

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USSR REPORT

SCIENCE AND TECHNOLOGY POLICY

CONTENTS

PREREQUISITES FOR SCIENTIFIC-TECHNICAL PROGRESS ENUMERATED

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA EKONOMICHESKAYA in Russian No 6, Nov-Dec 83 pp 36-46

[Article by A. Ye. Varshavskiy: "Problems in the Development of Scientific and Technical Potential"; passages rendered in all capital letters printed in boldface in source]

[Text] In this article the most important trends in scientific and technical development are used as the basis for an examination of problems in the assessment of the scientific and technical potential of national economic sectors and methods of accelerating its growth rate.

BASIC TRENDS IN SCIENTIFIC AND TECHNICAL DEVELOPMENT. The attainment of the objectives set at the 26th CPSU Congress, the objectives of continued economic growth, profound qualitative changes in the material and technical base as a result of the acceleration of scientific and technical progress, the intensification of national production and the enhancement of its efficiency, will be connected to a considerable extent with progressive changes in the structure of the national economy and the "organic combination of the achievements of the technological revolution with the advantages of the socialist system of economic management" [1]. As noted at the June (1983) CPSU Central Committee Plenum, it will be necessary to "secure the more intelligent use of the country's production, scientific and technical potential"[2].

National production efficiency was augmented considerably between 1970 and 1980 as a result of accelerated scientific and technical progress and improvements in the system of management. Nevertheless, as speakers noted at the 26th Party Congress, not all objectives were attained in this sector because several factors complicated the transition to intensive national economic development.

The analysis of problems connected with the natural laws governing scientific and technical progress and of economic problems affecting the retooling of the country's production network is of great importance in this connection. The following are the most significant characteristics and features of scientific and technical development.

First of all, scientific and technical progress represent, on the one hand, a process by which innovations are discovered and, on the other, a process of the increasingly extensive use of progressive technology, products and services. The interval between the time when the innovation first appears and the time when it is economically expedient can be quite long. In other words, the impact of the use of scientific and technical achievements is definitely delayed in the economic and social spheres; although innovations can create absolutely new possibilities and do reduce the value of old approaches and methods, only their widespread use can make a perceptible change in economic and social indicators.

Secondly, the nature of the interaction of scientific-technical and socioeconomic aspects of development differs considerably at each level of the production structure (industry, national economic complex or national economy).

Thirdly, scientific and technical development can be of an intensive or extensive nature. Extensive development is the simplest form and can have the greatest impact in some cases. An example of this kind of development is the augmentation of the productivity (or output) of a few types of machines or the modernization of existing equipment without any change in basic design. The continuous augmentation of the capacity of individual technological processes, machines and equipment is expedient up to a certain point, which must be taken into consideration in scientific and technical forecasts. New demands on parameters and operational conditions, the use of new items, the possibility of using better materials and components and an emphasis on possible advances in production technology necessitate the use of new designs, and this signifies a transition to the intensive type of development. The choice of technical policy, particularly over the long range, presupposes the establishment of the appropriate balance between extensive and intensive types of scientific and technical development in various national economic sectors.

Fourthly, scientific and technical progress generally leads to the dramatic acceleration of the development of an economic facility only when the latter is not dependent on external conditions. External limitations (the inadequate development of related industries, the consumer's lack of preparedness to use the industry's products, imperfect repair and maintenance conditions, insufficient supplies of crude resources, materials and energy, the need for capital renewal, inadequate personnel training, the lack of the proper organization, etc.) invariably diminish the economic impact of scientific and technical achievements. Furthermore, in some cases the economic impact of innovations can be negative; in other words, its introduction can be premature. Consequently, the technical level of innovations must correspond to the level of fixed productive capital, supplies of crude resources, materials and components, the professional qualifications and skills of personnel and the conditions of organization and management.

These natural requirements indicate the causes of slower rates of scientific and technical progress and suggest ways of eradicating them. Prior to our examination of problems in the development of scientific and technical potential, we will examine problems connected with its assessment.

Table 1

Industries Grouped According to Level of Technical Potential*

Industry	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Ranked According to Indicators**										
Electrical power engineering	2	1	1	1	1	1	(1)***	(1)***	1	10	1
Fuel	3	2	3	2	2	1	(2)***	(2)***	4	21	2
Ferrous metallurgy	1	3	2	2	2	2	1	1	3	17	2
Chemical and petrochemical	1	2	2	2	2	2	2	2	3	18	2
Machine building and metal processing	3	1	3	2	3	4	2	1	2	21	2
Timber, wood processing, and pulp and paper	4	4	4	4	3	4	4	4	4	35	4
Construction materials industry	3	3	2	3	3	2	3	4	3	26	3
Light industry	4	4	3	4	4	4	4	4	4	35	4
Food industry	3	3	4	3	3	2	2	3	4	27	3

* Calculated according to [3, 4].

** 1--industries with a high technical level, 2--average, 3--below average, 4--low.

*** Due to the absence of mechanized flowlines and automatic lines in electrical power engineering and the fuel industry, their rank is estimated.

Key:

1. Percentage working in laboratories, design offices and experimental subdivisions
2. Percentage of engineering and technical personnel
3. Percentage of workers engaged in manual labor, excluding repairs
4. Percentage of specialists with a higher and secondary specialized education
5. Capital-labor ratio
6. Percentage of completely mechanized enterprises
7. Average number of mechanized flowlines per enterprise
8. Average number of automatic lines per enterprise
9. Percentage of machines and equipment of the highest quality category produced for industry (in total output of these types of machines and equipment)
10. Level of technical potential (total rank points)
11. Relative level of technical potential

ASSESSMENT OF SECTORIAL SCIENTIFIC AND TECHNICAL POTENTIAL. The division of scientific and technical potential into two components (that is, scientific and technical) is due to more than just the differences in their origins and their effect on the initial appearance and subsequent spread of innovations. Organizational and statistical factors also play an important role, particularly the fact that all scientific establishments are united in the single national economic sector of "Science and Scientific Service."

Scientific potential depends on the developmental level of scientific establishments and, to some degree, of the laboratories, design bureaus and experimental subdivisions of sectorial enterprises. The level of scientific potential is measured according to the level of personnel training, the capital-labor ratio, proportional expenditures on research and development (R & D) and the results of R & D. The formation of scientific potential is connected with the training of scientific personnel in the network of the Ministry of Higher and Secondary Specialized Education and post-graduate studies, with the growth of the fixed productive capital of scientific establishments by means of the appropriate capital investments, etc.

The technical potential of a national economic sector is the result of the widespread use of scientific and technical achievements. It is measured by the level of personnel skills, the level of technology, machines and equipment, the degree of production automation and mechanization and the quality of manufactured products. Its growth depends on the speed with which scientific and technical achievements are disseminated. In turn, scientific potential and technical potential are among the factors determining the speed of this dissemination; in other words, there is a reciprocal connection.

The scientific potential of national economic sectors and industries is highly differentiated. In view of the absence of precise means of measuring scientific potential, indirect factors must be used in its assessment. They can include such specific indicators as the volume of total and current expenditures or the cost of sectorial R & D projects (all projects, including those conducted by sectorial scientific establishments), the value of the fixed capital of scientific research establishments per worker engaged in the sphere of sectorial science or per scientific worker, the percentage of doctors and candidates of sciences in the total number of persons employed or scientific workers and the number of people working on a single project.

The choice of indicators is based on the assumption that the results of research activity depend on the supply of resources and the level of personnel skills in the R & D sphere. It can also be assumed that high proportional indicators of resource supply and indicators of scientific skills will correspond to higher scientific results even with the extensive use of the results of world science (in this case, total resource expenditures can be reduced). Comparisons to economically developed Western countries indicate that a high percentage of highly skilled scientific personnel (doctors of science), approximately equivalent to the indicator for university R & D, raises the level of R & D in industry.

The assessment of scientific potential with the aid of these indicators is performed in the following manner. An average level is determined for each indicator in the group of sectors in question (for example, industries). Each sector is then assigned points for each indicator--for example, 1 point for a sectorial indicator above the average, 2 points for an average indicator, and 3 points for below average. The points are then totaled. Obviously, the point system of assessment is approximate, but it can be used to categorize sectors in terms of their level of scientific potential. This indicates

sectors with the highest level of scientific potential, in which the appearance and dissemination of scientific and technical achievements occur more quickly than in sectors with a lower level.

The categorization of industries and some branches of machine building in terms of four levels of scientific potential (high, average, below average and low) with the aid of this method produced the following results: 1) high level of scientific potential--petrochemical, gas, chemical, pulp and paper and microbiological industries, ferrous and nonferrous metallurgy, power machine building, etc.; 2) average level--petroleum and medical industries, electrical power engineering, electrical equipment industry, instrument building, etc.; 3) below average level--food, meat and dairy, and construction materials industries, agricultural machine building, machine building for light and food industry, etc.; 4) low level of scientific potential--light industry, timber and chemical industries, construction and highway machine building, machine building for animal husbandry, etc.

These categories are largely hypothetical but there is indirect evidence of the validity of this approach. For example, ferrous metallurgy (high level of scientific potential) is distinguished by the export of a large quantity of licenses, including exports to developed capitalist countries. At the same time, the low level of scientific potential in chemical machine building (lowest category) means that large quantitites of equipment for the chemical industry have to be imported.

The absence of the appropriate means of measurement also precludes the precise determination of the technical potential of national economic sectors and industries. A similar approach can be taken to its assessment. The only difference is the broader range of indicators. They can include the following: 1) the level of technical, design and technological projects at sectorial enterprises (percentage of total labor force employed in laboratories, design and experimental subdivisions and mechanization departments, including the percentage of engineering and technical personnel working in enterprise design subdivisions, etc.); 2) occupation skills level of production personnel (percentage of engineers and technicians, percentage of specialists with a higher and secondary specialized education, etc.); 3) technical level of production (percentage of workers performing operations with the aid of machines and mechanisms or monitoring automatic machines, including workers engaged in the manual repair and adjustment of machines and mechanisms; capital-labor ratio, percentage of completely mechanized and automated enterprises in sector, average number of mechanized flowlines, average number of automatic lines per enterprise, technical level of machines and equipment delivered to sector--measured, for example, according to the average percentage of items of the highest quality category in machines and equipment for the sector, etc.); 4) product quality level (percentage of products of the highest quality category in total output, etc.).

The results of the categorization of industries in terms of their level of technical potential are presented in Table 1. Just as in the assessment of scientific potential, the industries have been grouped in four categories. As we can see, the industry with the highest technical level is electrical

power engineering, those with an average level are machine building and metal processing, the fuel, chemical and petrochemical industries and ferrous metallurgy, those with a below-average level are the construction materials and food industries, and those with a low level are light industry and the timber, wood processing and pulp and paper industry. The correlation of assessments for each indicator is high.

Let us take a closer look at the procedure of assessing the technical potential of industries, using the example of the indicator of occupational skills, measured as the ratio of specialists with a higher and secondary education to all workers and employees in the industry.

The dynamics of the proportional numbers of specialists with a higher and secondary specialized education in national economic sectors and industries are presented in Table 2. If the percentage of specialists with a higher and secondary specialized education in industry as a whole is taken as the basis, specific industries can be assigned to four different categories in which the percentage of specialists with a higher and secondary education: 1) exceeds the average indicator for industry as a whole; 2) is equivalent or slightly higher than the average; 3) is lower than the average and 4) is much lower than the average.

Electrical power engineering is in the first category--the percentage of specialists with a higher and secondary education in this industry is far above the average for all industries. The second group consists of the chemical and petrochemical industry, ferrous metallurgy, machine building and metal processing, as well as the fuel industry, for which the indicator is 15-35 percent above the average. In this group, the steady increase in the percentage of specialists with a higher and secondary education in the fuel industry is particularly striking, and this is connected primarily with the development of the petroleum and gas industries. The third group consists of the food industry, the construction materials industry and others. The fourth category--light industry and the timber, wood processing and pulp and paper industry, which accounts for around 25 percent of all industrial production personnel--is distinguished by the lowest percentage of specialists with a higher and secondary specialized education. Furthermore, the indicator is rising more slowly in light industry than in industry as a whole [4, p 211]. Agriculture and transportation can also be relegated to the fourth category.

CHARACTERISTICS OF SOME TRENDS IN THE FORMATION OF SCIENTIFIC AND TECHNICAL POTENTIAL. The transition to the intensive type of economic development, distinguished by the more efficient use of national economic resources, will depend largely on the country's scientific and technical potential. The tendency in recent years toward extensive development in the sphere of research activity and the current structure of technical potential in national economic sectors and industries are inhibiting the intensification of production.

The most significant of the factors which are inhibiting intensification by promoting extensive development in the R & D sphere are the following.

Table 2

% of Specialists with Higher and Secondary Specialized Education in Average Annual Number of Workers and Employees in Branches of the National Economy*

Branch of National Economy	1965	1970	1975
Industry	8.3	11.0	14.2
Electrical engineering	14.1	19.1	23.2
Chemical and petrochemical	11.8	14.7	18.2
Ferrous metallurgy	10.4	13.6	18.0
Machine building and metal processing	10.6	13.8	17.2
Fuel industry	8.9	12.4	16.9
Food industry	6.8	9.1	11.9
Construction materials industry	5.6	7.6	10.7
Timber, wood working, and pulp and paper	3.7	5.2	7.6
Light industry	4.4	5.6	8.0
Agriculture (specialists in all fields)	--	3.1	4.6
Specialists in agricultural fields	--	2.7	3.8
Transportation	5.6	7.6	7.6
Communications	7.6	9.1	12.4
Construction**	6.7	9.7	13.5
Trade, public eating facilities, material and technical supplies and sales, procurements	8.3	10.9	14.4

* Calculated according to [4].

** Excluding project planning, exploratory design and research organizations serving construction.

First of all, supplies of resources are not growing quickly enough. In 1980 the supply was equivalent to around 16,000 rubles per scientific and scientific-pedagogical worker in the USSR, which was only around 6 percent higher than in 1976 (calculated according to [3, pp 125-128]).

Secondly, there is a discrepancy between the contingent of scientific and scientific-pedagogical workers and the volume of R & D expenditures in VUZ's. At the present time, VUZ's account for around 40 percent of all scientific and scientific-pedagogical personnel, including over 50 percent of all doctors and candidates of sciences, but R & D expenditures represent only around 6 percent of all scientific expenditures (calculated according to [3, pp 125, 128; 4]). This unavoidably gives rise to minor projects and the dissipation of funds, which reduces the quality of VUZ research even more. The short duration of projects (less than a year on the average) and the low level of expenditures (per project and per scientific and scientific-pedagogical worker) testify that major scientific projects are not being conducted in many VUZ's (see [5]), and some dissertations prepared in VUZ's (with the exception of head institutions) are not concerned with the resolution of major scientific problems. This is also related to the quality of post-graduate studies in VUZ's. They account for over 60 percent of all post-graduates [3, p 127], and almost two-thirds of all VUZ post-graduates attend

school full-time (in scientific establishments only one-third of the postgraduates attend classes).

Thirdly, after the extremely rapid increase in the number of scientific personnel from the end of the 1950's to the beginning of the 1970's, the growth rate began to decline, and this means that scientific personnel are older and that the transfer of experience and knowledge from the older generation to the younger is more difficult due to the relative decrease in the number of young specialists.

The intensification of scientific labor will be impossible without a better resource supply, the more uniform development of various sectors of the R & D sphere, a rise in the qualitative indicators of scientific personnel through the better training of young scientific workers and the rapid replacement of older specialists on the condition of the more efficient use of the results of their activity.

Fourthly, extensive development in the R & D sphere is being promoted by defects in the system for the planning and selection of scientific research projects and programs, departmental barriers and the longer research-development-incorporation cycle. Besides this, the increase in the number of R & D personnel, particularly in plants, is due to a low level of specialization and standardization.

Fifthly, gaps between levels of scientific potential in various national economic sectors and industries are a serious problem because they intensify the differences in the levels of their technical development. For example, annual expenditures per worker engaged in R & D, the percentage of doctors and candidates of sciences in scientific establishments, the number of persons working on a single project and other indicators in such sectors as the chemical industry, construction and highway machine building, machine building for animal husbandry, the lumber industry and light industry are half or less than half as high as in the petrochemical, gas and chemical industries, ferrous and nonferrous metallurgy and power machine building.

The low level of scientific potential in these industries ultimately causes the technical retardation of the consumers of their products--other national economic sectors and industries--which takes the form of a low level of comprehensive mechanization and automation, a high percentage of workers engaged in manual labor, a relatively low percentage of machines and equipment of high quality, etc. (the lowest technical standards in production are now found in the timber, wood processing and pulp and paper industry, light industry, the food industry and the construction materials industry--industries in which around 40 percent of all industrial labor resources are concentrated [4, p 211]. Analyses indicate that differences in the levels of technical potential in national economic sectors and industries are not disappearing and are actually growing. In particular, one indicator of technical potential--the percentage of engineering and technical personnel in the total number of industrial production personnel--is rising more slowly in such industries as the food industry, light industry and the timber, wood processing and pulp and paper industry than the average indicator for all industries.

The choice of a scientific and technical policy must be geared to the reduction of differences between levels of scientific and technical potential in national economic sectors and industries. Special attention must be paid to a continuous rise in the level of specialization and standardization.

One important current objective is a change in several traditional ideas about scientific and technical progress, which have begun to inhibit the intensification of national economic development.

An analysis of the most important scientific and technical achievements over 30 years (1950-1980) indicates that the ones distinguished by the most rapid dissemination first appeared mainly between 1950 and 1970. The major guidelines of technical progress during this period were a transition to progressive energey resources, primary mechanization, the growth of specific capacity, the transition to more progressive technology, the automation of processes and the production of progressive items.

By the end of the 10th Five-Year Plan the dissemination of progressive technology had slowed down and several directions of scientific and technical progress (primarily those connected with the transition to progressive energy resources and the mechanization of the main production processes) had been completed in many national economic sectors. In construction, agriculture and other sectors, for example, the primary mechanization of individual operations had been completed by the end of the 1960's [3, pp 135-145]. Further technical progress in these operations is connected with the development of more progressive machines and equipment.

At the same time, there was a dramatic increase in the speed with which scientific and technical achievements were disseminated in several important areas (including the stabilization of proportional fuel expenditures, the level of mechanization in some agricultural processes, etc. [3, pp 134-145]. The accelerated growth of technical potential in national economic sectors and industries will require a transition to the development of priority fields of scientific and technical progress. This will necessitate not only the determination of priorities, but also corresponding changes in planning and management for the purpose of more efficient and balanced sectorial technical development. The improvement of planning and management is being complicated by the fact that the acceleration of technical progress is now connected primarily with the priority development of certain production fields and types of technology, products and services; in other words, it depends on intrasectorial investment policy.

The main objective of technical development in the 1960's and 1970's was the augmentation of the specific capacity (or productivity) of technological processes, machines and equipment, accompanied by their increasing complexity. In many cases, growing capacities and complexity could not be balanced with existing conditions of operation, maintenance and repair or supplied with the necessary material and energy resources and skilled manpower. As a result, the high projected capacity (or productivity) of new equipment was not achieved in many cases. What is more, overall indicators of the use of machines and equipment were lower than the indicators of earlier equipment.

For example, the dramatic augmentation of the productivity and complexity of grain combines without a corresponding increase in reliability and durability raised the withdrawal coefficient to 1.5 times the figure in 1965-1970, when agriculture was supplied with the less productive and simpler SK-4 models (calculated according to [3, pp 239, 241]).

The tendency to surpass the optimal maximum capacity of machines and equipment resulted in lower efficiency indicators, particularly a rise in the average price per unit of capacity for the majority of basic machine models.

In the 9th and 10th Five-Year Plans there was a particularly noticeable tendency toward concentration on the design and manufacture of primarily the main products and the development and improvement of the most basic technological lines, processes and production fields. As a result, the development of auxiliary tools of labor could not keep up with the development of basic equipment and the actual efficiency of machinery systems did not meet their projected efficiency (for example, the average output of the standard Belarus' tractor in the Ukraine in 1980 was almost 1.5 times as great as that of the high-power K-700 and T-150 tractors because the latter were equipped with less than half of the complete set of implements) [6]. Besides this, the impact of mechanization and automation at several enterprises was low (for example, in rolling mills, where all of the main processes had been automated, around half of all the metallurgists at some enterprises were engaged in auxiliary processes, involving primarily manual labor).

The discrepancies of the 1970's between levels of technical development in national economic sectors and subsectors at a time of insufficiently organized economic management have increased the dependence of the dissemination of scientific and technical achievements on socioeconomic factors and the scientific and technical potential of related sectors, slowed down the rise of technical standards and diminished the economic impact in the spheres of production and consumption.

For example, the more effective use of computers is being inhibited by organizational problems, the slow improvement of the technological base of production, the lack of progress in existing systems for statistical computation and the collection of information and the shortage of qualified specialists in the software field and the operation of the new equipment (in particular, the shortage of qualified personnel and the low production standards at some enterprises have kept indicators for machine tools with digital programmed control lower than indicators for ordinary equipment). In addition to this, one of the reasons for the slow dissemination of progressive metal products is that the sectors using these products are technically unprepared for this.

Between 1970 and 1980 the actual impact of new products was generally lower than the estimated impact due to the failure to acquire the necessary material and labor resources, machines and mechanisms required for the new equipment, the failure to observe operational and maintenance requirements, the excessive intensification of production capacity use, delays in incorporation and procedural problems in the calculation of the economic impact, which was not based on primary bookkeeping data in the consumption sphere. This

led to sometimes unwarranted increases in the wholesale prices of new products (primarily in machine building and chemical industry).

On the whole, the effect of economic, natural and social limitations of the dynamics of the dissemination and effective use of scientific and technical achievements had become much more pronounced by the end of the 1970's. They had a particularly strong effect on the development of technically backward sectors (light industry, the food industry, the timber, wood processing and pulp and paper industry and the construction materials industry).

WAYS OF ACCELERATING THE GROWTH RATE OF SCIENTIFIC AND TECHNICAL POTENTIAL. At the present time it is particularly important to achieve balanced scientific and technical development--that is, the correspondence of the level of scientific and technical achievements to the level of fixed productive capital, the supply of crude resources, materials and components of the necessary quality, the skills and professional level of workers engaged in production (or the operation of new equipment), the conditions of organization and management, the preparedness of related sectors and the sectors using the new products, the conditions of the operation, maintenance and storage of new equipment, etc. The actual impact of scientific and technical achievements will match the projected impact to the maximum under the conditions of precisely this kind of balanced scientific and technical development.

The resolution of this balance problem is extremely important for the effective use of non-traditional scientific and technical achievements--such as products of robot engineering, powder metallurgy, etc. In particular, the incorporation of robotized technological complexes must be accompanied by precisely regulated production, high production standards, continuous material and technical supply operations and unfinished parts and pieces of high quality, which will require changes in many cases in the present system of interaction by enterprises in the same sector or even in several.

To achieve balanced technical development, it will be important to consider the present and future conditions of the consumption (or use) of innovations and to supply production and the consumption sphere with the necessary material and labor resources. Furthermore, R & D should be geared primarily to the design and development of progressive technological processes and products which are not inferior to the best current models and are the optimal models for the existing conditions of their production and utilization. Besides this, one objective of R & D and production should be the development of new technology and products with high competitive potential, designed primarily for export and limited consumption within the country (in a few sectors, regions, enterprises, etc.) as a basis for the further development of sectorial science and technology.

In the future it would be wise to concentrate on the development and manufacture of primarily the main products and the improvement of basic technology and to emphasize (especially in the initial stage) the need to raise the developmental level of the majority of auxiliary production units and types of products to the level of basic units in all national economic sectors. In the manufacture of tools of labor, this will necessitate the design and

production of machinery systems for the performance of complete technological processes.

In order to balance the increasing capacity (or productivity) and complexity of equipment with the conditions of its operation, maintenance and repair and the supply of the necessary resources, the development of technological processes, machines and equipment should be geared to higher indicators of quality, reliability and durability (in relation to the increase in specific capacity) with the minimization of expenditures on production, operation, maintenance and repair. This will considerably heighten the impact of innovations, particularly in agriculture, the fuel and timber industries and other sectors, where the need for large deliveries of machines and equipment to replace older equipment is inhibiting the growth of technical potential by diverting sizable production capacities and reducing the mobility of several machine building branches.

To heighten the final impact for the consumer, reduce the price of new equipment per unit of impact and improve the system of incentives for the manufacture of progressive products, it will be necessary to revise existing procedures for the calculation of economic impact and to improve the pricing system.

The intensification of R & D will require improvements in the planning and management of science. This must be done with a view to the fact that improvements in scientific planning and management will depend on the system of planning and management in the national economy as a whole. Special attention must be given to the priority distribution of resources among the most important fields, goal-oriented financing, the coordination of plans for scientific and technical development with plans for capital investments and the incorporation of capital, the creation of effective systems of program management and the provision of scientific establishments and sectors with better incentives to incorporate the results of R & D projects.

The accelerated development and dissemination of innovations in industries and the national economy will necessitate, firstly, a system of priorities in which preference is given to progressive, resource-conserving technology [7]. Secondly, special attention must be given to the eradication of economic and social limitations on scientific and technical development. This will considerably heighten the speed of the dissemination of technical achievements and will augment their impact.

"A unified scientific and technical policy," a speaker noted at the June (1983) CPSU Central Committee Plenum, "is of decisive significance now. Colossal work awaits us in the development of machines, mechanisms and technology for today and tomorrow.... All of this will bring about a genuine revolution in our national economy" [2].

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APPLICATION OF SOCIALIST PRINCIPLES IN THE MANAGEMENT OF SCIENCE

Moscow OBSHCHESTVENNYYE NAUKI in Russian No 6, Jun 83 pp 37-50

[Article by Viktor N. Arkhangel'skiy, doctor of economic sciences, professor, chief of the Department of Economic Problems in Scientific and Technical Progress at the Economic Problems of Comprehensive Development of the National Economy Institute, Moscow; and specialist in the field of economic problems in the development of science; Fedor F. Glistin, candidate of economic sciences, department chief at the Scientific Research Institute of the USSR Central Statistical Administration, and specialist in the field of statistics of scientific and technical progress; and Ivan P. Leshkin, sector chief at the Scientific Research Institute of the USSR Central Statistical Administration and specialist in the field of statistics of scientific and technical progress; the article is based on a chapter from the collective monograph written by scholars from Bulgaria, Hungary, the GDR, Poland, and the USSR: "Upravleniye nauchno-tekhnicheskim razvitiyem v usloviyakh sotsializma" [The Management of Scientific and Technical Development under Socialist Conditions], Moscow, "Progress", 1982]

[Text] The scientific and technical potential that has been developed and its practical application are playing an increasingly important role in the development of the socialist economy. The objective advantages of socialism that come with public ownership of the means of production and the planned development of the economy are also evident in the sphere of science and technology. The planned development of the national economy brings with it an objective need for well-planned and controlled scientific and technical progress. In connection with this, one of the most important problems that has been posed by communist and workers' parties of socialist countries is the establishment of an organic tie between the achievments of the scientific and technical revolution and the advantages of the socialist system of management.

An increase in the practical role of science in production and turning science into a direct productive force will lead to a situation in which the scientific complex of socialist countries will take on more and more of the characteristics of a sector of the national economy. Science not only consumes

considerable resources*, it also produces goods that are capable of meeting certain national economic demands. Furthermore, the development of science is being carried out according to a plan that has been coordinated with the plan for the development of national production. This leads to a change in the industrial structure of the national economy which is tied to the priority development of those industries which utilize scientific discoveries. Scientific discoveries form a basis for the development of whole subsectors of physical production. The specialization of industry and science is intensified and there is an increase in the importance of cooperation at all levels of management.

The system of centralized management makes it possible to carry out a unified state science and technology policy; to concentrate the efforts of scientific collectives in the most important and effective directions of scientific and technical progress; to determine the most promising topics for research and development; to distribute all the work among the people involved according to their experience, scientific expertise, and the available material and technical base, avoiding unwarranted duplication; to direct their activities in the interest of society as a whole; to provide the most important projects with the required quantities of all types of resources; and to make systematic utilization of scientific and technical achievements in production.

There are a number of principles that form the foundation for the process of managing scientific and technical development under socialist production conditions; adherence to these principles guarantees highly effective research and development.

One of the most important principles of socialist management that can be applied totally to the sphere of scientific research and development is "development according to a plan". Scientific development is realized in accordance with state and industrial plans for scientific and technical progress. The plans determine the amount and direction of work done by scientific institutions; plans are used to help coordinate research and to determine the distribution of financial and material resources among the developers. Innovations are disseminated according to a plan for the introduction of new techniques and methods, which is an important section of the consolidated national economic plan.

Under conditions of the scientific and technical revolution, the principle of "scientific orientation" forms the basis for all management activity. In the sphere of scientific management this principle is expressed in the application of new methods and means of management that are based on a knowledge of the general principles of national economic development and their application in

*In 1980 in the USSR, for example, 4,379,000 people were employed in the sphere of science and scientific services; 21.3 billion rubles were spent on science (cf. "Narodnoye khozyaystvo SSSR v 1980 g. Statisticheskiy yezhegodnik" [The National Economy of the USSR in 1980. Statistical Yearbook], Moscow, 1981, pp 358, 524.

combination with a new factor in economic growth--scientific and technical progress. This principle calls for a broad application of thoroughly sound scientific administration methods that include issues of objective social and economic evaluation and a selection of scientific and technical problems that are tied to the resolution of key national economic problems; material incentives for the most effective research and development; and improving the quality of research and development. In particular, the principle requires broad application of economic and mathematical methods and electronic computers. The principle is reflected in the development of an automatic control system for science and technology that is a subsystem of the statewide automatic control system for the national economy.

The principle of "scientific orientation" is incompatible with voluntarism in making decisions and it assumes the following: an in-depth study of the general trends in scientific and technical progress, the demands of production, and society's resource possibilities; the maximum national economic effect will be obtained; the possibilities of scientific research and planning organizations will be taken into account and coordinated with the demands of production; the most important scientific and technical problems will be selected and their resolution will be scientifically sound.

The principle of "national economic effectiveness" is tied directly to the incorporation of achievements of scientific and technical progress into the national economy. Implementation of this principle includes a comprehensive evaluation of all possible effects obtained as a result of introducing a given innovation: economic, social, ecological, scientific, technical, cultural, educational, and so on. These effects must be compared to the anticipated costs and those operations should be chosen that promise the maximum effect when implemented.

An evaluation of the effectiveness of the expenditure of manpower and labor resources on research and development is the most important factor in making decisions. This must be calculated at all the stages of research, development, and incorporation of new techniques, and it is used extensively in setting up plans at all levels.

The principle of "long-range applications" plays an important role in managing scientific and technical progress. A basic quality of science--progressiveness---forms the foundation of this principle. Progress in science and technology and its national economic effect can be evaluated only by examining a sufficiently long period of time that includes all stages of scientific and technical progress. The principle of "long-range applications" requires an in-depth study of the predictions of scientific, technical, and economic development on the basis of long-term plans for the development of science and technology. The scope of planning and predictions should encompass not only issues involved in implementing scientific and technical achievements, but also prospects for developing management methods and systematic practical application of these methods by the appropriate agencies.

The principle of "continuity" is tied directly to the principles of "development according to a plan", "scientific orientation", and "long-range applications" in the management of scientific and technical progress. It

assumes complete interdependence and continuity among all types of plans for technical and economic development. The five-year plans and current plans for the development of science and technology should be worked out as parts of the long-range and five-year plans, respectively. This principle dictates the need not only for mutual coordination and continuity among all the plans for scientific and technical development, but also the maintenance of a constant level of planning. This means that when working out a five-year plan, it is necessary to consider the prospects of scientific, technical and economic development 15-20 years in the future. When yearly plans are being worked out, the prospects for the next 4-5 years should be taken into account. This approach will increase the continuity of the plans substantially and it will make optimal improvements in the plans. The principle of continuity also requires organization of constant, active control over the course of research and development. As one of the most important functions of management, this type of control makes it possible not only to discover deviations from the plan, but also to take the necessary measures to ensure that an entire set of operations will be carried out.

In the sphere of scientific research, as nowhere else, it is necessary to adhere to the principle of "combining centralized management with creative initiative". This principle corresponds completely to the methodology of socialist planning, based on conscious utilization of the objective economic laws of socialism. The basis of this principle is centralized determination of the directions of scientific research and development, which represents a set of interconnected scientific and technical problems and refects the state's science and technology policies. In addition to this, the creative initiative of scientific collectives takes on great importance in the resolution of a number of practical problems, in organizing research operations, and in determining what research is most promising from the scientific standpoint and most effective from the national economic standpoint. This principle corresponds completely to contemporary methods for managing the national economy, the basic elements of which are being applied extensively in the sphere of scientific research.

The principle of "material and moral incentives for labor results" in the sphere of science is no less important than in physical production sectors. It provides motivation for prompt completion of scientific research and development work, the creation of models of new technology that are on the level of world standards, and accelerated incorporation of research and development results into physical production. This principle can be carried out through a system of material incentive funds formed at scientific organizations and industrial enterprises that use actual savings from the application of new technology in production, on the basis of a proportionate distribution of the effect, or sums stipulated in contracts. Broad implementation of cost accounting in the sphere of applied research and development is also of great importance in carrying out this principle.

The principles described above form the theoretical basis for an analysis of the existing mechanism and for working out better methods for managing scientific and technical development. The effectiveness of management depends directly on the methods applied, on how well they coordinate plans for scientific and technical development with national economic plans, how well

they direct scientific research and development toward specific goals, and how well they select the scientific, technical, economic and organizational tasks that will be studied and for which the most effective resolutions will be worked out.

As the November (1982) and June (1983) Plenums of the CPSU Central Committee emphasized, it is not only necessary to propagandize new technology and new labor methods, but also to reveal and eliminate specific difficulties that interfere with scientific and technical progress, and to make outdated operations unprofitable. The resolution of this problem requires that representatives of natural, technical, and social sciences, and practical workers join forces for an in-depth analysis of the entire set of factors--economic, organizational, psychological, etc.--that complicate the incorporation of new technology.

Several basic directions can be distinguished when studying issues in the management of science:

--theoretical problems of scientific and technical progress, the role and place of science in the system of social production, the economics of scientific and technical progress;

--problems of managing scientific research and development in sectors of the national economy and their effectiveness;

--issues in predicting scientific and technical progress;

--problems in the automation of control over scientific research and development;

--the formation of a data base for the development of science and technology.

In spite of the relatively large number of publications on this problem, it must be noted that individual aspects of the issue have not received equal attention. The political, economic, and legal issues in managing scientific and technical progress have not be studied adequately and insufficient attention has been given to questions of regional management of the development of science. Without covering the entire problem, the majority of publications primarily describe the tactics involved in managing science and technology. This is characteristic of the current stage of research on problems of scientific and technical progress in all socialist countries.

Since one of the primary advantages of the socialist system of management lies in the possibility of planned control over an entire group of processes and projects that generate and make practical use of knowledge, a multi-dimensional approach to management is of the utmost importance. The problem of increasing the effectiveness of scientific and technical progress cannot be resolved successfully only by introducing new techniques and technology, without taking into consideration questions involving the selection of themes in forming plans, providing scientific and planning organizations with the necessary scientific and technical data, and developing methods for determining expenses and utilizing economic and mathematical methods and electronic computers. The

problems involved in introducing achievements of scientific and technical progress require not only that the economic mechanism connecting science and production be improved, but also that organizational problems in coordinating plans for scientific research and development and the technical development of production, and centralized planning for introducing the most important scientific and technical achievements be resolved. Furthermore, the problem of increasing the effectiveness of scientific development and of scientific and technical progress in national production today cannot be solved without taking into account the effect of the law of socialist division of labor in this sphere of social activity.

In addition to coordination of scientific activity within the framework of CEMA, mutual coordination of long-term plans for developing science and long-range national programs for scientific and technical progress, taking into account the emerging international specialization of scientific and production complexes in various socialist countries, is of immense importance in increasing the effectiveness of national production.

In order to realize the advantages of socialism in the area of accelerating scientific and technical progress, it is necessary to improve the methodology used to manage scientific and technical development on the basis of a systematic approach and development of a general management concept that corresponds to the practical demands of communist construction. This approach requires that top priority be given to the problem of creating a comprehensive system for managing scientific and technical development that unites all the levels, functions, and aspects of management and provides coordination and continuity.

This type of management system will make it possible to resolve successfully not only tactical, but strategic problems directed at an organic union of socio-economic and scientific and technical processes involved in improving society's material and technical base. This system will help coordinate research on a common methodological basis, it will provide it with more concrete direction, and it will increase its national economic effectiveness.

From the standpoint of the fundamental possibilities of management, the validity of plans, possibilities for evaluating the national economic effect and the degree of influence on national production, science itself is usually divided into two spheres. One of these spheres includes research that is directed at generating knowledge that helps broaden our understanding of the physical world and that lays a foundation for future scientific and technical progress (this is fundamental research). The second sphere includes research that is oriented toward finding ways to resolve specific scientific and technical problems; this is research that primarily pursues the goal of meeting certain national economic demands (applied research and development). This classification has a substantial drawback: there is no opportunity to classify a great deal of scientific research and development that simultaneously pursues scientific and cognitive goals as well as practical aims; this includes discoveries of great scientific and practical importance in various branches of science.

As a rule, methods for carrying out scientific research and development fall into two categories: theoretical and experimental. This classification is used in resolving questions of material and technical supply for scientific research and development and organizing experimental production and testing. It also fails to provide a single definition for the majority of scientific research and development, which calls for the application of both theoretical and experimental research methods. The division of scientific research and development into theoretical and applied research suffers from the same drawback, since more often than not scientific research and development has multiple results.

Another classification that is used frequently is the aspect of "probability" in scientific research and development, on the basis of which research is divided into work of a "prospecting" nature and "purposeful" work that has specifically defined goals. The first category includes research that is distinguished by a great deal of uncertainty with regard to its possible results and methods for obtaining these results. All other scientific research and development, which carries a significant probability of obtaining specific results using known methods, is purposeful research with specifically defined goals. This classification is also extremely conditional since any research carries with it some probability and always involves a certain amount of searching, and therefore there is always a degree of uncertainty surrounding the results.

The lack of a unified classification for scientific research and development complicates resolution of the most important problems involved in research planning, financing, and organization, and some problems (specifically regulation and comparison of expenditures for basic types of scientific research and development by various ministries, departments, and scientific research organizations) cannot be resolved at all.

The essence of scientific research and development is defined by the simultaneous presence of two characteristics. In the first place, new scientific knowledge is the result of scientific research and development; in the second place, obtaining scientific knowledge is a creative process. It is obvious that in managing the process of obtaining scientific knowledge, that is, the development of science, the first characteristic of scientific research and development plays an extremely important role. This characteristic reflects the fact that the research results belong to the body of new scientific knowledge. This is explained by the fact that the effectiveness of science is determined primarily by the quantity, quality, and structure of the new scientific knowledge that is obtained and applied in practice. In light of this, in any any sector of science and technology and at any level the resolution of all basic problems in the management of scientific research and development is tied primarily to obtaining, classification, analysis, and application of scientific knowledge, which contains the goals of scientific research and development itself and the management of scientific research and development.

One can draw the necessary conclusions about the content of a unified method for classifying scientific research and development by analyzing typical problems in managing scientific development. The first conclusion is that in

all sectors and at all levels in managing the development of science and technology, it is necessary to have a system for classifying scientific research and development in which the primary focus is results, or scientific knowledge. The second conclusion is that the most important element in managing the development of science and technology is the classification of scientific knowledge according to its relation to the three most important typical problems in managing the process of obtaining scientific knowledge--the development of science itself, determination of ways to make effective use of established scientific knowledge, and the development of technology.

In connection with this, we believe that a unified method of classification should define the following basic types of scientific research and development:

--fundamental scientific research: creative work, the results of which provide new scientific knowledge regarding nature and society;

--applied scientific research: creative work, the results of which provide new scientific knowledge regarding the possibilities, principles, and methods of the practical application of established scientific knowledge;

--scientific developments: creative work, the results of which provide new scientific knowledge regarding new forms for the material, physical, and functional application of scientific knowledge, taking into account the conditions in specific areas of practical activity.

These definitions include only the essential characteristics of scientific research and development that reflect the novelty of scientific results and the creative manner in which they were obtained. Therefore they can be applied to scientific research and development in all branches of science, including the humanities. Here, of course, one must keep in mind that in some branches of the humanities only fundamental and applied research would be applicable.

Therefore, this classification of scientific research and development can be carried out on the basis of a certain characteristic of scientific knowledge, which we will call the systematic development of science. This name is warranted because the classification reflects the specific features of the development of science as an integrated system. By dividing all scientific knowledge into the three types described above, we are naming three subsystems in science. The first subsystem will contain knowledge about nature and society (the first type of knowledge); the third subsystem will contain knowledge about existing technology, that is, about what has been developed artificially (the third type of knowledge); and the second subsystem will contain knowledge about knowledge (the second type of knowledge), that is, knowledge about the possibilities of applying established knowledge of all types to develop new knowledge of all three types. The second subsystem performs the function of exchanging knowledge within the entire system of scientific knowledge. These functions are essential for the development of science as a whole. The existence of these subsystems is a necessary condition for the development of science as a system of scientific knowledge. If science is lacking just one of these subsystems, its development will cease. This method of classifying scientific research and development meets all the basic demands of the general theory of classification and contemporary methods for

planning and managing scientific research and development, including the demands of programmed and specially directed management.

Special mention should also be made of the independence of this classification method from the specialization of scientific research activity. In defining the types of scientific research and development, only the particular features of the scientific knowledge were taken into account, without consideration of the fact that it was the result of scientific, planning and design, experimental and testing, or any other kind of activity. Therefore, this method of classification can serve as a model for all branches of science and all levels of management of scientific and technical development, including all academic and industrial scientific research organizations.

Management of fundamental scientific research is limited to a significant extent by the high degree of uncertainty in the research results, the practical impossibility of specific determination of its effectiveness and specific deadlines for completion, as well as specific determination of areas in which the results can be applied. Therefore, fundamental scientific research is planned on a short-term basis and only in terms of basic directions, themes, expenditures, approximate completion deadlines, and volume of work.

The resolution of applied problems plays the most important role in increasing the efficiency of national production. Applied research and experimental and design work absorb more than 85 percent of the total expenditures on science. This is work that is pursuing specific social, economic, scientific, and technical goals and is at that stage when completion deadlines, necessary expenses, and the anticipated effect can be determined with a high degree of reliability. Stricter management methods can be applied to this type of research, that is, methods that are based on planning the volume of work, the time required to perform the work, and its national economic effect that is tied organically to the country's social and economic development.

The mechanism for managing all types of scientific research and development should take into account the interdependence of research and development work done in countries of socialist cooperation, the need for scientific specialization and stronger ties with the national economy. The mechanism should satisfy the following objective demands:

1. Formation of a national scientific and technical policy should proceed from the possibility of a planned exchange of scientific and technical achievements among socialist countries and utilization of the entire scientific and technical potential of CEMA countries. Each country must have a definite scientific specialization, which should basically correspond to its production specialization.

2. A plan for the development of science and technology should take into account first and foremost the national economy's demands for scientific and technical achievements.

3. When choosing from a wide range of scientific and technical problems or from alternative resolutions for one problem, one should select the most promising ones in terms of a national economic effect. Here the primary

limitation of planning operations is the total amount of resources allocated for this purpose. One of the basic indicators of an optimal plan is well-balanced resources.

4. Planning of the most important scientific and technical problems should be centralized, since this makes it possible to solve two planning and economic problems: topics for research and development can be distributed among those involved in the work without unwarranted duplication; social and economic tasks and their scientific and technical resolution can be coordinated within the framework of a state plan; thus not only the development, but also the incorporation and application of research results in the national economy can be planned.

5. Economic management methods should be supported by a unified system of indicators, that encompass state financing, cost accounting, evaluation of effectiveness, material incentives, etc. These methods should be used at all stages of research and development, so that the national economic effect of scientific research and development and the possibility of meeting the various demands of society can serve as a criterion in the formation of a plan.

6. Planning of all stages of scientific research and development should be continuous. This means not only that intermediate results should not be permitted to go unused, but also that there will be continuity and appropriate preparations will be made ahead of time for the next stage in the operations; in a number of cases there are also plans for parallel work to be performed.

The methods and mechanism for planning science and technology should correspond to the mechanism for planning the national economy and should make use of new opportunities opened up by theoretical research in the field of systems analysis, economic cybernetics, and the economics of scientific and technical progress. The methodology now being developed for long-range planning also requires that full consideration be given in the plan for the anticipated effect and technical possibilities of science and technology.

One of the important theoretical tasks of management is the study of the mechanism of turning scientific and technical ideas into a new technique or a new process. A determination of the natural principles behind this process opens up broad possibilities for improving management methods.

Research on the process of creating major projects based on new technology and methods for managing them shows that the main drawback lies in a lack of correspondence between the methodology being applied and the essential nature of the process of developing and realizing knowledge, and in ignoring the objective stages of the latter. Lack of coordination among the functions of dynamically changing projects and insufficiently flexible methods of managing these projects will not be noticed until they begin to have a negative effect on the entire system of national production. This is reflected primarily in reduced efficiency in the utilization of resources. In this case, the law of a steady increase in the efficiency of national production requires qualitative changes in the management system and its methods, in the structure of management organs, and in the means of management. The need to improve the management of scientific research is the result of at least four economic

causes. These include the high and ever-increasing expenditures on scientific research and development and on incorporating the results into physical production; the high potential effectiveness of expenditures on science and technology; a reduction in the period of time before innovations become outdated; the limitation of the resources that society allocates for the development of science and technology.

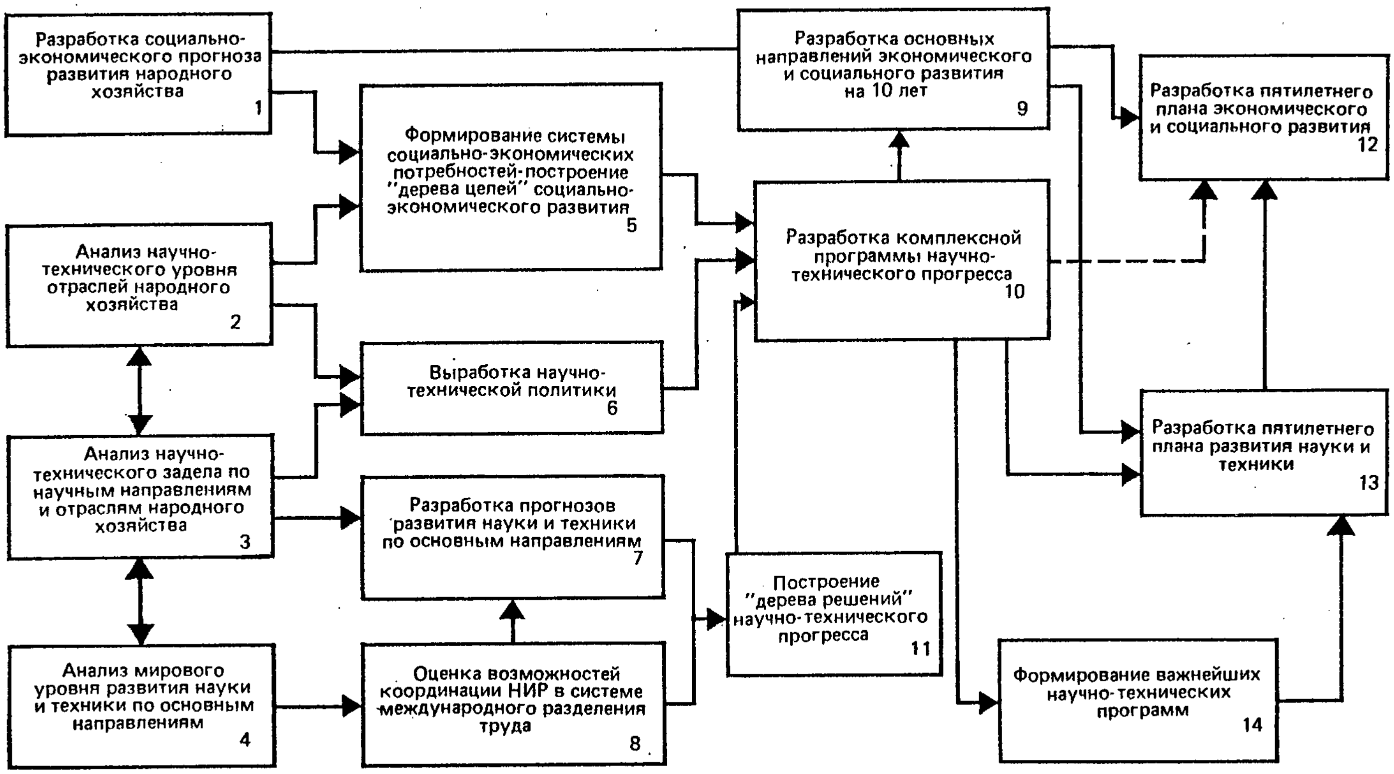
Scientific and technical progress enters all spheres of human activity and thus requires that greater expenditures be made to develop science and technology and to incorporate the results into production. The rate of growth in scientific and technical development exceeds the rate of growth in the national income. There is no doubt that it is possible to increase the economic yield from introducing new techniques and technology into national production, and that the technical development of production is a direct result of realizing the achievements of science.

The scientific and technical revolution, bringing about an intensive accumulation of knowledge, at the same time reduces the period of time before scientific ideas become outdated. While suggesting new (and as a rule, more efficient) solutions for technical problems on a higher level, science also reduces the period of their practical use in production. Periodic introduction of innovations requires considerable expenditures for the production and assimilation of new equipment, and the need to replace relatively new equipment with improved equipment reduces the period of the economic effect. Thus, scientific and technical progress aggravates the problem of establishing scientifically sound rates for renovation of production, selecting innovations to be incorporated, and reducing the time spent on developments; these are all management issues. The contemporary level of development in the management of science, theoretical and methodological developments, and the existing technical means make it possible to resolve problems involving the management of science on a new, qualitatively higher level.

Systems analysis is the methodological basis for studying the functions and mechanism of management of scientific and technical development as a complex, multi-level system with all its diverse features and varied methods. With the help of systems analysis it is possible to resolve not only tactical, but also strategic problems in the development of science and technology.

The application of basic principles of the theory of socialist management and the methodology of systems analysis makes it possible to work out a general approach and formalized mechanism for the system of managing the development of science and technology, and to provide a logical foundation for the stages of this work and their content. This approach can be illustrated in a diagram.

The diagram presented here illustrates the rational relationship between the formation of plans for the development of science and technology, their content, and interdependence with plans for the country's economic and social development. At the first stage, a guided prediction of the national economy's social and economic development is worked out. In socialist countries this prediction is based on the primary goal in the society's development--an improvement in the workers' welfare and satisfaction of their



Fundamental diagram of how the plan to develop science and technology is formed

1. Development of a social and economic prediction for development of the national economy.
2. Analysis of the scientific and technical level of sectors of the national economy.
3. Analysis of the scientific and technical work in progress in various scientific directions and sectors of the national economy.
4. Analysis of the worldwide level of scientific and technical development in basic directions.
5. Formation of a system of social and economic needs--construction of the "tree of goals" in social and economic development.
6. Development of science and technology policy.
basic directions.
8. Evaluation of possibilities for coordinating scientific research and development in the system of international division of labor.
9. Development of basic directions for economic and social development for a 10-year period.
10. Development of a comprehensive program for scientific and technical progress.
11. Construction of a "tree of solutions" for scientific and technical progress.
12. Development of a five-year plan for economic and social development.
13. Development of a five-year plan for scientific and technical development.
14. Formation of the most important scientific and technical programs.

material and cultural needs. The prediction includes the estimated increase in these needs during the given period and a determination of the structure of social and economic goals that will help meet these needs. This structure is reflected in the "tree of goals" for social and economic development.

In the formation of the social demands made on science, one must also evaluate the existing material and technical base of production, and determine on this basis the most important directions for the development of new technology and analyze the scientific and technical work already in progress. This analysis should indicate the extent to which the directions for developing science and technology correspond to the demands of production and the possibilities of utilizing in science the international socialist division of labor and world achievements.

The development of scientific and technical predictions should indicate the expected results from developing science and technology in various directions and the social and economic consequences.

As a result of forming a comprehensive program for scientific and technical progress, it will be possible to coordinate the demands of developing the socialist society with the opportunities for meeting these demands by making use of the anticipated acheivements of science and technology. Social and economic goals for the society's development and directions in the development of science and technology can be defined more precisely as this program is being worked out. This will make it possible to develop a unified science and technology policy.

A comprehensive program for scientific and technical progress makes it possible to guarantee the resources for the basic directions of national economic development for 10-15 years, and to provide a high degree of effectiveness in scientific and technical progress. The basic directions include specific tasks for sectors of the national economy in terms of the most important economic and social indicators, that stem from the data in the comprehensive program. The basic directions for the development of the national economy are refined further in the corresponding five-year plans.

Consistent application of the basic, principled positions for managing the development of science and technology, that are the result of the advantages of the socialist system of management, provides broad opportunities for assimilation of the socialist countries' national systems for managing the development of science and technology and for creating an international system within the framework of CEMA. The application of a general, formalized mechanism would make it possible to automate calculations, increase the coordination and effectiveness of science and technology plans, to evaluate the effect of scientific and technical progress on the development of the national economy, and to expand the international possibilities for working out the most important scientific and technical problems and for broad application of

effective scientific and technical solutions in the national economies of socialist countries. Improving the management of science on this basis would contribute to a significant increase in the effective utilization of the total scientific and technical potential in the worldwide system of socialist cooperation.

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PROBLEMS OF PROMPT ADOPTION OF NEW TECHNOLOGY DISCUSSED

Moscow IZVESTIYA in Russian 6 Dec 83 p 2

[Article by IZVESTIYA special correspondent A. Ivakhnov in column "Supreme Soviet Between Sessions": "Science for Production--The Preparatory Commission for Science and Technology Is in Session"]

[Text] We all know: the way of solving many economic problems facing the country lies in activation of scientific research, strengthening the tie between science and production and speeding up introduction of the achievements of science and technology into the national economy. Scientists, ministers and personnel of planning organs know this. But time passes and sometimes a "tremendous distance" exists to the time of introduction of new developments. Why does that happen? Usually, the ministries in question usually have a ready answer: either the plan was not reinforced with resources, or the construction people let it down, or subcontractors failed to deliver materials or equipment on time. At the same time, the State Plan for Economic and Social Development of the USSR whose constituent parts consist of scientific-technical programs is the same for all and its fulfillment is the law of our economy. Deputies of the USSR Supreme Soviet--members of the preparatory commission --discussed this quite specifically. Such organs form permament commissions of the chambers for analysis of materials presented by ministries and departments.

Without Allowances for "Difficulties"

When preparing an article on qustions of scientific-technical progress, we journalists also have frequently supported ministries which without adequate reason put the blame on careless subcontractor plants or on financial planning organs. The deputies of the USSR Supreme Soviet have ceased making allowances for difficulties. Prior to convening in Moscow, they familiarized themselves in detail with the very complex mechanism of passage of something scientifically new from the conceptual stage to the work bench. At a meeting of the Preparatory Commission for Science and Technology, it was reported that more than one- half of delays in introduction of new equipment have occurred because of the fault of the "interested" ministries themselves.

Of course, at the commission's meeting, reference was made to positive happenings, to the consistent and planned development of science and technology. And to what broad prospects were being opened up to our economy by the decree of the CPSU Central Committee and the USSR Council of Ministers "On Measures for Speeding Up Scientific-Technical Progress in the National Economy." Still the main thing on which the deputies' attention was concentrated on was a discussion of unresolved problems.

Representatives of state committees and ministries spoke at the meetings. They spoke seemingly convincingly. But this would be followed by a question, a second, third and..., alas, some of the speakers simply were not able to answer the deputies' questions. It became clear that we still have a lot of weak spots in this area of the economy.

A.I. Chubarenko, the chief of the combined department of science and technology as well as a member of the collegium of Gosplan USSR, reported at the meeting that recently the committee had heard a whole series of ministries on fulfillment of scientific-technical programs. He also confirmed that the lion's share of the reasons for the lags came from insufficient attention given to these operations by respective sectorial services so that they were unable to control in time or to solve the arising questions.

But here is something that is interesting: it turns out that for one reason or another Gosplan USSR is postponing for the time being the report of this or that ministry which failed to reach targets. And with the coming of a new time period, all the lags are eliminated and everything is normal. This means that no "objective" reasons exist for disruption of plan targets. The deputies reasonably made the conclusion that it was time to implement effective measures so that sectorial chiefs would consider without being reminded of it that fulfillment of scientific-technical plans was their most important task.

Today far from all ministries are filled with this concern. They make poor use of existing levers to oblige certain personnel to definitely fulfill the obligations imposed on them. This was mentioned in particular at the meeting by Deputy P.A. Solovyev, general designer of a machine-building plant.

The raised question is a serious one. Actually, if a plan for scientific-technical work is not fulfilled, regardless of what the reason might be, are there specific persons responsible for this? At the meeting, some legal information was divulged: the responsibility for scientific-technical progress and the technical level of production belongs to the ministry. Personal responsibility for the fulfillment of targets imposed on the sectors, particularly targets relating to adoption of achievements of science, is borne by the minister. The deputies stated unequivocally: it is essential for the responsibility of officials for scientific-technical progress in a sector to be not only on paper but also be in reality a means of practical work.

Special attention was paid at the meeting to the question of further robotization of production. The plan draft provides for a significant increase in the production of industrial robots. But have places for their use been determined, will enterprises be ready for the effective use of this equipment?

"Isn't there the possibility," V.A. Zgurskiy, ispolkom chairman of the Kiev City Soviet of People's Deputies, asked, "that the more robots that enterprises of a ministry will have, the more 'solid' they will look even if these marvelous machines are gathering dust at warehouses?"

A.I. Chubarenko was obliged to admit "that this question has not been finally resolved. Work is going on on the State Program of Automation in which this will be taken into consideration."

Effectiveness of Recommendations

"Last year," Deputy S.R. Rafikov, chairman of the presidium of the Bashkir Department of the USSR Academy of Sciences, noted, "the State Committee for Science and Technology was given recommendations by the committee. To the best of my knowledge, they were not carried out. In particular, the question was raised there of speeding up the construction of experimental bases. And here are the results: of the 93 installations planned for last year, only two installations were built. Such an attitude of ministries and departments to the fulfillment of most important stages relating to the adoption of new technology, deputies have declared, is inadmissible. The state committee must adopt decisive measures for the elimination of this lag. Furthermore, in the commission's last recommendations, it was noted that it is necessary to make the fullest possible use of inventions and completed results of research of important economic value. How are these recommendations being fulfilled?"

"Analysis has shown," K.M. Dyumayev, deputy chairman of the committee, replied, "that half of this work was not ready for adoption. For a new development to be recommended for production, all the questions beginning with the economy and ending with ecology have to be carefully worked up."

No one can dispute that there are many difficulties. Still such a reply concerning the fate of deputies' recommendations could not satisfy the commission.

Kirill Mikhaylovich was also asked other very significant questions--for example, to what extent are our scientists provided with measuring equipment and instruments, what steps are being taken for putting the network of scientific institutions in order. There was reason for discussion and argument.

From Conception to Adoption

The question has come up again of the effectiveness of work of scientific institutions after the speech of V.V. Kryuchkov, chairman of the Committee of People's Control.

"Checks show," Vasiliy Vasil'yevich said, "that at a number of ministries and departments the actual situation is embellished in reports and the work of scientific institutions is evaluated in terms of its anticipated economic rather than actual economic effect. And, of course, awards are issued according to calculation of the anticipated effect. At the same time, projects recommended for series production frequently lie on shelves and become obsolete. People's controllers have found out that many inventions whose adoption is provided for in the state plan were created more than 10 years ago. That is,

we are knowingly putting away for tomorrow the production of obsolete equipment. Frequently unconscionable workers and even heads of enterprises and scientific institutions exaggerate the magnitude of the economic effect stemming from the use of inventions and efficiency proposals and receive unjustifiably large author's rewards. Following the checks, about 120,000 rubles were returned to the state treasury. The USSR State Committee for Inventions and Discoveries must revise the instructions on awarding of bonuses and provide masterial rewards for the actual creators of new equipment and also put an end to abuses."

V.V. Kryuchkov's report elicited a lively exchange of opinion. It was stated that scientists would be glad to introduce developed new items, but not everything depends on them. How does one evaluate the work of an institute, if it issues scientific products at the level of present requirements but their realization is put off from one year to the next?

"One thing is state evaluation of the effectiveness of work of an institute, V.V. Kryuchkov gave his opinion, "but the personal contribution of the scientists is another. We cannot praise sectorial science, regardless of how many new ideas they might provide, if the ministry marks time and from year to year fails in the fulfillment of targets for new equipment.

Concern for the Future

A lively discussion arose at a meeting of the preparatory commission following the speech of I.M. Makarov, deputy minister of higher and secondary specialized education. Igor Mikhaylovich said that the USSR Ministry of Higher and Secondary Specialized Education has for all practical purposes become a sector of science. Each year researchers of higher educational institutions obtain about 20,000 authorship certificates and hundreds of patents. VUZ's participate actively in carrying out complex scientific-technical programs. In many instances they are head institutions.

"At the same time," I.M. Makarov emphasized, "we run into many difficulties. Sectorial organizations frequently do not fulfill contractual obligations concerning the practical utilization of the obtained results. The VUZ--the development's author--becomes a suppliant: it must literally hammer out the act on introducing its developoment or information on the economic effect to be obtained. Methods of determining this effect are imperfect, for which reason the information is often of a formal character."

"Igor Mikhaylovich, in Moscow there is a surplus of candidates of science but in union republics there is a lack of them. What is the ministry doing to eliminate this disproportion?--was the question that followed.

"Unfortunately, they frequently send us casual people for graduate study work. These are unable to bear the study load and go back. We state the question as follows: let the republic send whomsoever it wants, but these people must take examinations where they expect to study."

The speech by A.I. Isakov, a representative of the USSR Higher Certification Commission, served as a kind of continuation of the discussion. The work

of the commission reflects as in a mirror deficiencies in the training of specialists of top qualifications. The members of the commission are concerned by the small number of defended disserations on problems of modern machine building, particularly those dealing with the specialty "robots and manipulators" and other important disciplines.

The representative of the Higher Certification Commission was asked a question: specialists with high qualifications work in our industry who have no degrees although they have made a considerably greater contribution to the national economy than other scientists with degrees and titles. These people are needed by production. They do not always have enough time for taking examinations or preparing dissertations. It is necessary to see to it that the best of the specialists making a contribution to the development of science and technology are enabled to obtain an academic degree.

"We," Aleksey Ivanovich replied, "offer a green light to such competitors. But the following picture is observed: a specialist from production obtains an academic degree and after a short time he is in a VUZ. In the sector, unfortunately, the title of a scientist carries little prestige."

Deputy S.R. Rafikov, representative of the preparatory commission, directed attention to a number of pointed questions.

"Frequently," Sagid Raufovich said, "the ministry reports on the introduction of a scientific-technical innovation at an enterprise, but we have no idea if it is being put out in series. For example, the Ministry of Petroleum Industry reported back on the introduction of a new insulation material. But gas lines continue to be insulated with an imported film. Or take sanitary engineering equipment made from polymer materials, the introduction of which was reported by the USSR Ministry of Construction Materials Industry. We see it in first-class hotels and sanatoriums, but no one has heard of such sanitary engineering equipment in ordinary construction.

"A second question. We have compiled scientific-technical programs and senior officials and head organizations have been appointed to them. But they lack the means to affect work fulfillment. It is necessary that the head of a program have a council consisting of representatives of basic performers and that he possess adequate authority."

The deputies discussed many other problems: inadequately effective utilization of unique equipment at institutions of the USSR Academy of Sciences, nonobservance of standards and technical conditions by enterprises, defects in the system of financing scientific research, which obliges scientists to spend time on the fulfillment of certain little-effective economic-agreement work. Concern was stated in regard to the fact that the draft plan for 1984 does not include a whole series of the targets of the five-year plan for development of new equipment and the introduction of progressive production processes.

Specific recommendations were worked out for the examined questions. These will be reflected in the conclusions of budget planning and other permanent commissions of the chambers relating to the country's draft plan and budget for 1984.

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IMPROVED REGIONAL MANAGEMENT OF SCIENTIFIC PROGRESS URGED

Moscow TRUD in Russian 4 Oct 83 p 2

/Article by V. Kvint, candidate of economic sciences, Moscow: "The Region's Scientific Potential"/

/Text/ Scientists at the Siberian Department of the USSR Academy of Sciences under the guidance of B. V. Voytsekhovskiy, corresponding member of the academy, developed a hydropneumatic hammer. Its productivity twice exceeds existing crushers. Nor are there machines equal to it abroad. Siberians did not stop at this and with the forces of their special design bureau developed a prototype now used in the basic production of the Kola Severonikel' Combine. Mining enterprises in the Kola Peninsula need dozens of such machines. If territorial bodies in Murmansk Oblast had manifested an initiative, local machine building plants could have not only provided their region with them, but also supplied this efficient machine beyond its boundaries. However, instead of this Kola miners demand that Siberian scientists begin, in fact, the series production of hammers.

The existing situation is a typical example of the underestimate and underutilization of the capabilities of the regional scientific and technical potential.

The economic tendencies formed in the USSR by the beginning of the 1980's qualitatively changed the nature of national economic development. The growth of the able-bodied population was slowed down threefold. The rates of increase in capital investments declined sharply. The need for the most economical and careful utilization of material and power resources intensified.

Against the background of these processes a successful accomplishment of urgent tasks--realization of the USSR Food Program, further strengthening of the fuel and power potential and accelerated overall drawing of the natural resources of the regions of Siberia and the Far East into the national economic turnover--brings about a rise in the significance of regional potentials for increasing the efficiency of scientific and technical progress. The report by Comrade Yu. V. Andropov, general secretary of the CPSU Central Committee, "Sixty Years of the USSR" stresses the following: "Modern productive forces ... require a close and competent combination of the efforts of various regions and republics in the same country."

How to draw the regional potentials of scientific and technical progress into this endeavor?

First of all, through a systematic implementation of a unified scientific and technical policy, which, as noted at the June (1983) Plenum of the Central Committee of the party, now acquires decisive importance. The unity of this policy envisages, among other conditions, a systematic combination of the scientific and technical capabilities and interests of the country's sectors and regions.

In practice, however, the situation is different. Whereas, on the whole, planning and management in the USSR are carried out on the basis of an interconnection of territorial and sectorial approaches, in the planning and management of science and technology the territorial aspect is neglected in many respects. As a result, the state finds a deficit of billions of rubles of efficiency of scientific and technical progress. For example, it is known how big the losses resulting from the inadaptability of part of the construction, mining and agricultural equipment to the natural and climatic conditions of its operation are. Breakdown and downtime of unadapted equipment under the conditions of the North and mountain and desert regions increase several times.

However, in addition to this, the failure to take into consideration the regional aspect of the scientific and technical policy leads to a reduction in the rates of development and introduction of new equipment, to its incorrect distribution and at times to an inefficient utilization of the scientific potential.

Here is an example. The realization of a systematic party policy of an outstripping development of the eastern regions of the USSR also requires an increase in the scientific potential here. However, the lack of an efficient territorial planning of its utilization has led to the fact that Siberian and Far Eastern scientists are occupied in large measure with the problems of the country's other regions and local enterprises are forced to resort to the services of specialists from central regions. In this case expenditures on missions and transportation alone increase the cost of research by almost 20 percent. For example, during the 10th Five-Year Plan higher educational institutions in Siberia and the Far East conducted only about 40 percent of their scientific research for the region's enterprises. Yet the establishment and maintenance of institutes in these regions cost the state much more than in the country's European part.

Some experience in the utilization of various forms and methods of taking into account the territorial aspect of scientific and technical progress has been accumulated in the last few years. This includes the development of regional scientific and technical programs, which are applied with special efficiency, for example, in Donetsk and Leningrad Oblasts, and interdepartmental goal-oriented scientific production associations and complexes operating in Lvov Oblast and Belorussia. Public councils for promotion of scientific and technical development, clubs for business meetings of scientists and practical workers and voluntary advisory firms operate under party and Soviet bodies in many cities, krays and oblasts.

The experience in the creative cooperation of scientists, planners and machine builders in Leningrad with builders in the Sayano-Shushenskaya GES /Hydroelectric Power Station/ has become widely known in the country. Developing this initiative, scientists and production workers in Siberia have embarked on a joint solution of problems concerning the development of the Norilsk Mining and Metallurgical Combine imeni A. P. Zavenyagin--the nonferrous metallurgy giant in the north of the country. They have developed the program "precious and rare metals, copper and nickel in Krasnoyarsk Kray."

Creative scientific and technical cooperation represents interproduction contacts of entire collectives. Therefore, the role of public organizations--Komsomol, trade-union and scientific-technical--rises immeasurably here. Unfortunately, they often keep aloof from this work.

Trade-union councils in Chelyabinsk and Donetsk Oblasts and in Krasnodar Kray by no means fully utilize their capabilities in the regional management of scientific and technical progress. Novosibirsk and Lvov Oblast Councils of the All-Union Society of Inventors and Efficiency Experts and of the Scientific and Technical Society have not defined their tasks in the development and increase in the return of regional programs for scientific and technical progress and of interdepartmental associations, although the innovative experience of these oblasts, on the whole, deserves to be popularized broadly.

After all, oblast, kray and republic councils of the All-Union Society of Inventors and Efficiency Experts and of the Scientific and Technical Society can ensure the coordination of scientific, technological and production organizations for the purpose of conclusion of agreements on creative cooperation by them. Territorial trade-union bodies and trade-union committees of the enterprises themselves have extensive opportunities to participate in this work. The recently adopted USSR Law on Labor Collectives creates a reliable basis for this activity for primary trade-union organizations.

Direct contacts of labor collectives in the sphere of scientific and technical progress can significantly accelerate the rates of technical retooling of production. Such a cooperation among scientists, engineers and workers of enterprises and institutes located in one region contributes to the formation of the technological order of production to science. Who, if not workers, know what, perhaps, individual technological tasks must be accomplished by the joint efforts of scientists and production workers so that, on the whole, the efficiency of operation of a large enterprise is increased considerably. First of all, this concerns the automation and mechanization of production and the introduction of industrial or simpler robots, but at times no less effective under specific machine conditions.

For example, Siberian excavator operators know well that the use of the primitive frozen ground ripper "wedge-ram" shortens the life of the expensive and scarce excavator to one-third. Why should trade-union organizations of Siberian construction projects not draw the attention of scientists, primarily from institutes located nearby, to this problem?

Regional forms of contact between science and production can also ensure considerable efficiency in the sphere of the agroindustrial complex.

For example, at present 60 percent of all the parts and units of agricultural equipment are put out of commission owing to the fact that ½ millimeter, or even less, of their working surfaces are worn out. However, it is not especially difficult to apply wear-resistant coatings recently developed by Soviet scientists, but the effect is tremendous. For an extensive popularization of this innovation the establishment of 12 regional centers has begun in the country recently.

It seems that now it is quite timely to raise the problem of the systematization and extensive popularization of the experience accumulated in the participation of public organizations in the regional management of scientific and technical progress. It is important to prepare standard statutes on the organization of scientific and technical cooperation in the region and on the participation of trade-union bodies and councils of the All-Union Society of Inventors and Efficiency Experts and of the Scientific and Technical Society in regional programs for scientific and technical progress and in other forms of the territorial integration of science and production, the mandatory development of which was first determined by the issued decree of the CPSU Central Committee and the USSR Council of Ministers "On Measures To Accelerate Scientific and Technical Progress in the National Economy."

11,439
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RESEARCH CENTER AT SARATOV BEARING PLANT DESCRIBED

Moscow EKONOMICHESKAYA GAZETA in Russian No 41, Oct 83 p 8

/Article by Ivan Andreyevich Yashkin, director of the Saratov Bearing Plant, Saratov: "Research Center at the Plant"/

> /Text/ For 6 years in succession the collective of the Saratov Bearing Plant (GPZ-3) has had first-class ratings in the all-Union competition of allied enterprises. Advanced technology and the latest equipment are introduced energetically here. Ivan Andreyevich Yashkin, director of the plant, discusses this.
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> His entire labor activity is connected with GPZ-3. After graduation from the Saratov Economic Institute in 1952 he worked at the plant as chief of the planning-control office, shop deputy and chief and chief economist. From 1963 through 1970 he was secretary of the party committee. In April 1970 I. A. Yashkin was appointed director of GPZ-3. Ivan Andreyevich is a deputy of the USSR Supreme Soviet.

The decree of the CPSU Central Committee and the USSR Council of Ministers "On Measures To Accelerate Scientific and Technical Progress in the National Economy" states the following: "To adopt decisive measures to strengthen all the links connected with the development and introduction of new equipment." Such links also include industrial enterprises. Certain experience in the utilization of the achievements of the scientific and technical thought in production has been accumulated at our plant.

Glancing at Tomorrow

At first I would like to discuss the system of management of technical progress at GPZ-3. Its first stage includes the preparation of the collective for the accomplishment of the tasks set for the enterprise for next year and for a long-term period. For this purpose technical conferences, seminars, studies in the system of economic education and training in the plant university of technical and economic knowledge are conducted. Exhibitions visually exposing the content and ways of solving urgent problems are organized.

The creation of objective conditions for innovative activity in the collective is the essence of the second stage. We consider the organization of creative brigades consisting of the most enterprising engineers and workers and their provision with scientific and technical information very important.

The planning of technical and organizational measures and control over their introduction represent the third stage. This work begins from the development of an annual draft plan for organizational and technical measures. All services and departments, whose function includes the replacement of obsolete equipment, improvement in technology and realization of rationalization proposals, participate in it.

As we see, everything that I have mentioned so far coincides with the ordinary practice of other machine building plants. However, there are differences at our plant. At GPZ-3 there is a department for laboratory and research work, which is commonly called the enterprise's "brain center." It is headed by experienced specialists possessing the ability to glance at the tomorrow of bearing production.

Whereas other plant services are engaged in everyday matters, this department works entirely for the immediate future. Its functions include the development of new technological processes not having analogs. The department has laboratories for cutting, polymer materials, polishing, abrasive materials, pressure shaping, powder metallurgy and testing of new equipment and an office for ordering models of new machinery.

Only 87 people are employed in the laboratories and the office. One-third of them are engineers and the rest, highly skilled workers able to embody engineering designs in metal.

For example, V. N. Mysovskiy--chief of the laboratory for polymers--and his assistants did a great deal during a comparatively short period. They developed a hinged bearing with a polymer race for stackers manufactured by the combine plant in Taranrog. This year we will manufacture more than 700,000 such bearings, which are noted for their high operating qualities. Engineers L. Vedenov, K. Polagutina, A. Maksyushin and N. Gladkova made a number of valuable developments.

In One Out of Six Laboratories

At a meeting with Moscow machine tool builders Comrade Yu. V. Andropov expressed the idea that labor collectives should persistently search for intraproduction potentials and thereby ensure the saving of all types of resources. Saratov Bearing Plant workers view the accomplishment of this task with understanding. The plant collective has set for itself the goal of reducing during the 11th Five-Year Plan the consumption of electric power per 1,000 rubles of output by 18 percent and of lowering the average rate of consumption of metal per 1,000 articles by the same amount.

At the same time, we pursue the course of manufacture of individual parts of bearings from polymers. The laboratory that I have mentioned above leans on the cooperation with several scientific research institutes and higher educational institutions in the country, especially with Rostov State University. For example, bearings based on woven antifriction compositions have been developed. Their use, for instance, in metallurgy in continuous steel teeming units will make it possible to save about 4 million rubles during the first year of operation.

Our plant's bearings with polymer, instead of steel, races have been used in the units of Niva and Sibiryak combines for several years. They do not need lubrication, which makes it possible to lower the total expenditures at combine plants and in agriculture by 700,000 rubles annually. GPZ-3 also derives a benefit, because the labor intensiveness of race manufacture has been reduced to one-fifth. To manufacture a race, it was necessary to perform 16 operations, but now three operations are sufficient.

Roller bearings, in which, instead of traditional brass separators, polymer separators are used, have been constructed at GPZ-3. During testing on mine sinking machines it has been established that their durability is 30 percent higher than that of bearings with a nonferrous metal separator.

Until recently parts from polymers have been manufactured on an experimental basis. A department for the production of bearing parts from plastics has been equipped this year.

As economists have estimated, owing to polymers, GPZ-3 will be able to annually save more than 400 tons of nonferrous metal. In the future this figure will certainly increase considerably.

I have dwelled on the activity of one laboratory. Other subdivisions of the research department also have quite specific programs. Their work is also of great economic benefit to the enterprise.

We have done a great deal for the mechanization and automation of production processes. In particular, we have sharply increased the production of needle bearings through the use of equipment fundamentally new for the bearing industry--automatic rotor lines. No one supplied us with such lines. We had to reequip with our own forces the structure of rotor lines for the machining of our parts.

The introduction of such equipment made us think further and search for technical facilities for an increase in labor productivity in contiguous technological operations as well. For example, automatic lines for electroplating and thermochemical treatment appeared at GPZ-3. The manufacture of needle rollers was also transferred to rotor presses and lines, but of other models. Finally, assembly was also automated, indeed, with great difficulty.

For the development of lines and automatic machines plant specialists A. Derov, A. Vasil'yev, Yu. Krasil'nikov, M. Voronin, A. Blazhnov, Yu. Filimonov and others were awarded medals and diplomas of the Exhibition of USSR National Economic Achievements. At present highly productive automatic equipment accounts for 85 to 90 percent of the machine tool pool.

Automated control over the quality of bearings was implemented for the first time at our production facility. Vladimir Afanas'yevich Matrosov, design engineer at the research department, and his wife, fitter-electrician Galina Yevdokimovna Matrosova, designed a range of active control instruments, which are not inferior to the best foreign models, for this. Other enterprises have now adopted such a method of control.

It Is Not Part of the Standard Structure

The laboratory and research work department "is not part" of the standard structure of a bearing plant. We had to defend the right to its existence. In our subsector subordinate to the Ministry of the Automotive Industry there were many who doubted the usefulness of and need for such a department. We were told: "There are scientific research institutes in every subsector. Let them handle scientific and technical progress; introduction is your business."

At first glance these arguments seemed convincing. However, our plant specialists did not agree with them.

The 10-year experience in the productive activity of the "brain center" (it was organized as a result of the redistribution and shifting of personnel within the enterprise) convincingly confirms that, if it had not existed, the plant collective could not have been able to replace to such a degree the technical facilities and technology that we have achieved.

The plant annually includes in the plan and implements up to 350 basic organizational and technical measures--as many as auxiliary production shops are able to fulfill. More than 800 innovations have been introduced during the first half of the 11th Five-Year Plan. The derived real savings have exceeded 4.5 million rubles.

It becomes more difficult to solve the ever more complex problems of scientific and technical progress at enterprises by traditional methods. In my opinion, such a service as the one at GPZ-3 is needed, perhaps not at every enterprise, but only at large enterprises engaged in the production of complex products. At one time the workers of the Ministry of the Automotive Industry doubted the need for the research department. They sent specialists to us, who during 3 weeks examined what the department did, whether it was a superfluous superstructure and whether its return was big. After careful familiarization they made a positive comment on its work.

Usually, the plant spends quite a long time on the conclusion of a contract with a scientific research institute. The development itself takes a fairly long period. But the plant department, if it embarks on a topic, aims at a rapid introduction. We order equipment without delays, find the production area for it and train shop personnel for work on new equipment in one of the department's laboratories. Everything is done jointly and simultaneously.

The research department has its own production section, where new models are tested and finished. We often buy prototypes developed by a scientific research institute on an experimental basis. We examine them, change something and then install them in shops. Thus, technical innovations appear earlier at our plant than at other enterprises of the bearing industry.

In connection with the acquisition of new goods I would like to express some views. I believe that the cost of equipment turned out by the Ministry of Machine Tool and Tool Building Industry, especially prototypes, has been unjustifiably increasing recently.

The scale of the annual replacement of the machine tool pool at our plant is optimal. It makes it possible to constantly raise the technical level of production and, therefore, labor productivity. We replace 3 to 4 percent of the machine tool pool annually. It is not easy to maintain this level. Certain appropriations for the acquisition of new equipment are allocated to the plant. However, we, consumers of a number of types of machine tools and units, to this day have not had sufficient opportunities to affect the technical level and cost of the new equipment acquired by the enterprise. In our opinion, sometimes it pays economically unjustified prices for machine tools. For example, the Zhitomir Machine Tool Plant set an obviously too high a price for an automatic line.

The situation must be changed now. In accordance with the decree of the CPSU Central Committee and the USSR Council of Ministers the role of consumers of products in the development of plans for the development and production of new equipment rises. Basic consumers will more actively participate in the determination of the perspective standardization and systems of machines and other equipment.

Cost accounting is characteristic of state enterprises, scientific research institutes and design bureaus. Of course, they should receive money for the new things that they have developed, but not sell the same thing dozens of times, as some institutes do.

It seems that such "commerciality" should not occur. After all, as a result, expenditures on technical progress in industry increase unjustifiably.

During 8 months of this year the GPZ-3 collective has fulfilled the plan for all basic technical and economic indicators. Additional output worth 150,000 rubles was dispatched. The search for potentials is intensifying.

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CEMA COUNTRIES' SCIENTIFIC-PRODUCTION COOPERATION DISCUSSED

Moscow OBSHCHESTVENNYYE NAUKI in Russian No 5, May 83 pp 217-220

[Article by N. Alekhin, candidate of economic sciences, academic secretary of the USSR Academy of Sciences Scientific Council on the Comprehensive Problem of the World Socialist System: "The Scientific-Production Cooperation of the CEMA Countries"]

[Text] A scientific-practical seminar was held on this subject on 14-15 March 1983 in Zvenigorod (Moscow Oblast) by the USSR Academy of Sciences Scientific Council on the Comprehensive Problem of the World Socialist System (USSR AS SCCPWSS), by the USSR Academy of Sciences Institute of the Economics of the World Socialist System (USSR AS IEWSS) and by the Inter-departmental Council on Questions of Scientific Research in the Area of the USSR's Foreign Economic and Scientific-Technical Ties, the Economics of Foreign Countries, International Economic and Currency-Credit Relations, which comes under the USSR State Committee on Science and Technology.

About 100 scientists and specialists from Soviet scientific-research institutions and practical organizations took part in the seminar, as did their colleagues from the International Institute of the Economic Problems of the World Socialist System, the Secretariat of the Council of Economic Mutual Assistance, and from a number of international economic organizations and coordination centers of the CEMA system. The goal of the meeting was to use a comprehensive analysis of accumulated experience as the basis for formulating practical conclusions and recommendations concerning possible measures to improve the mechanism of scientific-production cooperation between Soviet organizations and enterprises, on the one hand, and their partners from the fraternal countries, on the other hand.

Academician O. Bogomolov, director of the USSR AS IEWSS and chairman of the USSR AS SCCPWSS, opened the seminar. V. Shastitko, deputy director of the USSR AS IEWSS, presented the main report entitled "The Intensification of USSR Participation

in Economic and Scientific-Technical Cooperation with the CEMA Countries."

The seminar participants proceeded from the premise that under present-day conditions the acceleration of scientific-technical progress (stp) and the materialization of its achievements are becoming the decisive factors in the socio-economic development of all the CEMA countries. And accordingly, intensive cooperation in the sphere of science and technology is becoming a key direction in their cooperation. And it this kind of cooperation, which is organically coordinated with production cooperation and specialization, which will become the main activating force of the integration process in the 80's and 90's.

The successful completion of the task concerning the intensification of the CEMA countries' scientific-production ties will be determined to a significant degree by their capacity to more effectively bring their scientific-technical and economic potentials into the orbit of integrated cooperation.

The center of gravity in the general system of the CEMA countries' economic interaction is shifting more and more into the sphere of joint work on the establishment of new equipment and technologies and on the production application of the latest achievements of stp. The CEMA countries have already accumulated a wealth of experience in the joint resolution of scientific-technical problems, including large-scale problems. The following can serve as examples: the international production-technological complexes in such exceptionally important areas as computer equipment, atomic machine-building and others. At the same time, as people noted at the seminar, the 70's were a period of primarily extensive development within the system of scientific-technical cooperation. There were increases in the numbers of research investigations and projects on jointly-agreed upon subject matter, and more and more new organizations joined this work. But this was not accompanied by qualitative shifts in the actual mechanism of scientific-technical cooperation, nor was it organically coordinated with the process of international production specialization and cooperation (ipsc). This process is not grounded with sufficient firmness in the results of scientific-technical cooperation and by no means does it always become the logical continuation of such cooperation.

The seminar participants directed their attention to the fact that the organizational and technological separation of the two most important directions in the interaction of the CEMA countries--the scientific-technical and the production directions--constitutes a serious problem. In an analysis of the reasons for this phenomenon it was pointed out that the ipsc process is still frequently considered by the partners primarily with regard

to the inter-nation distribution of the product range produced within the framework of cooperation and production for the purpose of concentrating its production in one or several countries. Moreover, it would seem that this takes the form of advance agreement on the autonomous manufacture of specialized output on the basis of national economic complexes, which rely for support on their own production and scientific-technical potentials. As a result, there is no actual basis for uniting the international scientific-technical and production cooperation in a single complex. Moreover, the agreements on ipsc which are currently being used in the practice of the CEMA countries' economic cooperation do not stimulate to an adequate degree the joint scientific-technical and production activities of the partners. And although the comprehensive nature of cooperation is firmly established in these agreements, a majority of them represent unique, long-term trade contracts, in which only the range of products and the volumes for commodity deliveries are agreed upon; for the most part these products have already been part of reciprocal commodity turnover for a long time. And from the viewpoint of technical progress every agreement about ipsc must talk primarily about cooperation relations with regard to production and exchange of output, which still must be planned, put into production and produced in the optimal volumes on the basis of the given agreement. As a minimum this kind of agreement should stipulate the improvement of the specialized output which is already being produced.

Determining the subject matter of joint scientific-technical projects with regard to ipsc facilities is the starting point in planning international production cooperation, as well as in managing it at various levles. The agreements and contracts which are being concluded with regard to production cooperation must reflect the organic inter-relationship of scientific-technical cooperation and production cooperation in one organizational-legal complex.

At the present time the need has developed for a qualitative improvement in the mechanism of scientific-technical cooperation in order to further intensify it. Coordinating it more closely with the ipsc system of the CEMA countries will make it posible to accelerate the production application of stp achievements. As the seminar participants noted, substantial shifts in this direction are possible by establishing a firm organizational-legal and economic foundation for the cooperation at the sector and subsector levels and by undertaking a definite restructuring of the mechanism for cooperative interaction of associations, enterprises, scientific, planning-design and other organizations, i.e., of those units in which the problems of joint utilization of production and scientific-technical potentials are directly resolved. Economic agreements have great significance for the organization of specialized and cooperative production--on the

basis of direct ties--of agreed upon items, with production to be carried out according to progressive technology, unified standards, etc. These agreements are called upon to legally establish at a micro-level the entire aggregate of economic and production-technical conditions of cooperation which are required for the complete and prompt fulfillment by the partners of their obligations according to the agreement on production and scientific-technical cooperation. Thus, an economic agreement should encompass the entire cycle of cooperation--from the design of new equipment and its production on the basis of specialization and cooperation to the exchange of finished output and its use.

At the seminar an opinion was expressed with regard to the need for the joint development of a standard economic agreement between national economic organizations. This kind of agreement would be a legal document, which unites a coordinated working plan of production-technical cooperation between partners and to some degree a foreign trade contract. Further, the partners must carry full responsibility for the fulfillment of the obligations which they have taken upon themselves. For this reason they should be given the appropriate rights and authority to resolve independently an entire complex of questions related to the preparation, conclusion and implementation of an economic agreement on production-technical cooperation within the framework of direct ties.

In addition to direct ties, there are also other new forms of coopration which are promising, such as, for example, the establishment of international research collectives and coordination centers which function on the basis of national scientific organizations of the CEMA countries.

While touching upon questions of how to improve cooperation at the macro-economic level, the seminar participants pointed out that joint development of a comprehensive program of scientific-technical progress for the CEMA countries extending over a 20-year period is designed to become an important stage in the area of pre-plan and plan coordination of the basic directions of cooperation. This joint development could serve as the scientific basis of a coordinated strategy for scientific-technical and socio-economic development of the participating countries, as well as the basis for determining future directions in their cooperation. In other words, this kind of program will be a coordinated pre-plan, recommending document, which is periodically revised and corrected on the basis of prognostic evaluations of the future development of world science and science in the countries of the socialist community. The foundation for the compilation of this kind of program may be found in the aggregate of the respective national comprehensive programs, which are worked out independently as well as on the

basis of agreed-upon methods, principles, structures and time periods.

On the basis of this kind of general comprehensive stp program it would be advisable to compile (in addition to the priorities already established by CEMA) a list of the priority scientific-technical problems for joint work in the five-year plan period and in longer periods within the system of the comprehensive goal-oriented programs of economic cooperation which encompass the entire cycle from scientific research to the production and sale of new industrial output.

A whole series of other interesting proposals was put forward at the Zvenigorod seminar, including proposals on 1) the advisability of forming major international production-technological complexes, which would function under standardized conditions; 2) the endowment of sector ministries and leading scientific-production associations with the authority to resolve all questions related to economic agreements on direct ties and 3) the utilization of commodity-monetary instruments for the development of direct economic-contract relations. Plans call for all the proposals to be systematized and considered at a joint session of the organizations which had arranged the seminar.

8543
CSO: 1814/35

LANDMARKS OF PROGRESS

Moscow APN DAILY REVIEW in English 9 Nov 83 pp 1-5

[Article by Academician A. Alexandrov, Chairman of the Committee for Lenin Prizes and State Prizes in Science and Technology, USSR Council of Ministers]

[Text] The annual awarding by the CPSU Central Committee and the Council of Ministers of the USSR of State Prizes of the USSR for outstanding scientific and technical accomplishments and for textbooks of superior quality symbolizes the extraordinary importance attached by our party and Soviet Government to the scientific and technical progress of the country.

It is necessary to point to the growing standard of the works nominated for state prizes from 1 year to another. It can be boldly asserted that most of them deserve a very high appraisal. But the requirements to them are growing, too. This was characteristic of all stages, no matter whether these works were nominated at institutes or industrial works, or were extensively discussed in sections of our committee, in the press and in research institutions, or at the plenary session of our committee. Of the 180 works submitted this year, 80 were allowed to enter the contest after careful examination. The CPSU Central Committee and the Council of Ministers of the USSR have awarded state prizes of the USSR to 44 works and four textbooks at the committee's recommendations. This is a big holiday of creative work for our country.

From the days of Lenin, concern about the productive forces of our society has been in the focus of attention, while nowadays, to quote Yuri Andropov, acceleration of scientific and technical progress is the principal front of peaceful competition between socialism and capitalism.

Due to the advantages of the socialist system, our once backward, illiterate and poor country has turned over the years that have passed since the October Revolution into one of the two world superpowers--to use a term which is in currency in the West. Right after the revolution, the Soviet Government and V. I. Lenin himself showed great concern about the development of public education, about the eradication of illiteracy and about the progress of science and technology. During the Great Patriotic War a great role in the victory over fascism was played by the high scientific, technical, industrial and economic level attained by our country. The rapid development of our country in the post-war period and the accomplishment with our own forces of such monumental tasks

as the establishment of atomic and rocket technology have frustrated the imperialists' plans to start a war against our country and secured a long period of peace for us.

However, today the threat to peace is growing once again, and there are attempts to slow down the progress of our country, and to make it put aside a maximum of funds and means for the needs of defence at the expense of the economy. In this situation, acceleration of scientific and technical progress, improvement of the efficiency of the national economy and the earliest utilization of scientific breakthroughs in the industry and agriculture to consolidate the country's defence capability acquire special significance. Whereas earlier we could step up the volume of production by employing additional labour, today the gorwth of labour productivity must be the principal factor of economic development, and the key role here belongs to the improvement of technological processes, to the automation of production, designing and management, to the more efficient use of energy and materials and to the application of progressive materials. All this calls for the intensive development of fundamental sciences and for increased attention to the use of our own technological processes.

It was with all these points in mind that our committee examined and appraised the works presented for the contest. It is impossible to review all of them in a newspaper article, so I will just make a few illustrations.

For example, a state prize was awarded for the development and industrial application of a technology and a series of machines for the production of oil and gas pipes. This helped save over half-a-million tons of steel and about 100 million roubles in the period between 1978 and 1982, and nullify Reagan's embargo in this field.

V. D. Oleinikov and other authors developed and introduced in agricultural production machines and equipment for the comprehensive mechanisation of grain processing on collective farms and state farms. Industry has supplied 81,000 units of these means, which released more than 600,000 people during harvest-time. The cost of grain processing was reduced by 50-67 per cent, with the economic effect exceeding 1,150 million roubles. It is obvious how important it is for implementing the Food Programme of the USSR.

The Ministry of the Machine-Tool and Instrument-Making Industry has presented machine-tools of the "processing centre" type of the Ivanovo Machine-Tool Building Association for the processing of complex stationary base members, and machine-tools of the Leningrade Machine-Tool Building Association for finishing high-precision processing. Both the former and the latter are on a par with the best foreign makes, with the effect from their applications exceeding 170 million roubles.

In the field of electric machine engineering, mention should be made of the appearance of new technology and types of mica-and-paper insulation--micanites and micaplasts, which has helped to do away with the shortage of these materials and raised the quality and dependability of machines.

The successful implementation of the Food Programme will be facilitated by the materialized engineering idea of the Institute of Radio Engineering and Elec-

tronics, Academy of Sciences of the USSR, concerning the use of microwave frequencies for determining the moisture content of soil and the level of subterranean waters. Within an hour's flight, a plane of agricultural aviation checks up on the condition of several thousands of hectares of plantations. With the aid of this system it is possible to regulate watering, to prevent salinization, and leakage from irrigation canals, etc. Excellent results have been obtained with the aid of instruments developed at the institute, whereas the enterprises which a few years ago were charged to organise their quantity production have unfortunately not started it to this day.

Among the prize-winners, there are the designers of radio equipment of a new type for merchant ships and fishing boats. The equipment is unusual and incorporates 40 inventions. Thousands of complete sets of such equipment have been made, the entire merchant marine and fishing fleet re-equipped, and transmitters supplied to 27 other countries.

Of great importance for the development of advanced electrometallurgy is the new technology of vacuum arc remelting of high-alloy steel presented by the Central Research Institute of Ferrous Metallurgy. The process developed by V. N. Gotin and a large group of scientific workers results in an almost 15 per cent saving of power, increases the yield of useful metal by 15 per cent and raises the quality of steel. It gives one pleasure to note that the trend of electrometallurgy developed in this country by Academician E. O. Paton and elaborated by the Soviet schools of metallurgy, in the first place, by B. E. Paton, is being perfected. Together with other developments, the materialized engineering idea in question is also of great importance.

I cannot help drawing the attention of PRAVDA readers to the pure research findings making an important fundamental contribution of world science.

Mention should be made, for example of the work done by G. P. Georgiyev and other biologists, during which an important discovery was made and later corroborated by foreign research workers. It has transpired that there is a hitherto unknown class of genetic elements given the name of "mobile" or "leaping" genes. A further study, evidently, makes one hope for their importance for medicine and agriculture. The world priority of this research work has been recognised.

Similarly very important is the priority research work done by Academician P. G. Kostyuk and other scientists into the ion excitability of nerve cells. This work opens up a fundamentally new approach to problems of the physiology of the cell.

In the field of chemistry, pure and applied research findings enabled A. A. Vaulina and other scientists to suggest advanced scientific and technological approaches making it possible to organise the world's largest production of basic chromic products. As a result, our country has become a major producer of chromic compounds. More than 30 other countries buy them from the USSR.

Very significant is the work in the field of the chemistry of tracer compounds done by N. F. Myasoyedov and others, and basic physical research findings and discoveries in the field of reversal of the wave front of light (I. M. Beldyugin and others).

The above-cited achievements are only some of the examples; all others that won prizes are on a par with those described. Viewing them together, one can point out with satisfaction that the appeal of the party and Comrade Yuri V. Andropov to speed up scientific and technological progress has met with a direct response from the groups of authors whose successes have been so highly appreciated by the CPSU Central Committee and the Council of Ministers of the USSR, by all Soviet scientists

(PRAVDA, 8 November. In full.)

CSO: 1812/68

THE AWARD OF THE 1983 STATE PRIZES IN SCIENCE AND TECHNOLOGY

Moscow PRAVDA in Russian 7 Nov 83 pp 1, 2, 3

[Decree issued by the CPSU Central Committee, Yu. Andropov, secretary; and USSR Council of Ministers, N. Tikhonov, chairman; on the award of 1983 USSR State Prizes in the Field of Science and Technology]

[Text] Having reviewed the suggestions by the Committee for Lenin Prizes and State Prizes in Science and Technology in the USSR Council of Ministers, the CPSU Central Committee and the USSR Council of Ministers hereby decree:

The 1983 USSR State Prizes in the field of science and technology are awarded to:

I. IN THE FIELD OF SCIENCE

1. Akimov, Yuriy Konstantinovich, Nikitin, Vladimir Alekseyev, doctors of physical and mathematical sciences; Morozov, Boris Aleksandrovich, candidate of physical and mathematical sciences; Pilipenko, Yuriy Konstantinovich, candidate of technical sciences, sector directors of the Joint Institute of Nuclear Research; Zolin, Leonid Sergeyevich, Mukhin, Sergey Vasil'yevich, Shafranova, Mariya Georgiyevna, candidates of physical and mathematical sciences, senior scientific associates; Kopylov-Sviridov, Viktor Alekseyevich, doctor of physical and mathematical sciences, department deputy director; Kuznetsov, Anatoliy Alekseyevich, doctor of physical and mathematical sciences, laboratory deputy director, and the associates of the same institute; Vorob'yev Aleksey Alekseyevich, doctor of physical and mathematical sciences, director of laboratories of the Leningrad Institute of Nuclear Physics imeni B. P. Konstantinov of the USSR Academy of Sciences; Feynberg, Evgeniy L'vovich, corresponding member of the USSR Academy of Sciences, sector director; Tsarev, Vladimir Aleksandrovich, doctor of physical and mathematical sciences, laboratory director; and the associates of the Physics Institute imeni P. N. Lebedev of the USSR Academy of Sciences; for the series of studies on "Diffraction Scattering of Protons at High Energy," published between 1962 and 1980.

2. Bel'dyugin, Igor' Mikhaylovich, doctor of physical and mathematical sciences; and Nosach, Oleg Yur'yevich, candidate of physical and mathematical sciences; they are both senior scientific associates; Zubarev, Iosif Gennadiyevich, doctor of physical and mathematical sciences; and Fayzullov, Fuad Sobirovich, candidate of physical and mathematical sciences; they are both

sector chiefs and associates of the Physics Institute imeni P. N. Lebedev of the USSR Academy of Sciences; Bespalov, Viktor Ivanovich, doctor of physical and mathematical sciences and deputy director of the Applied Physics Institute of the USSR Academy of Sciences; Pasmanik, German Aronovich, doctor of physical and mathematical sciences, senior scientific associate at the same institute; Zel'dovich, Boris Yakovlevich and Ragul'skiy, Valeriy Valeriyanovich, doctors of physical and mathematical sciences and senior scientific associates at the Problems of Mechanics Institute of the USSR Academy of Sciences; Kochemasov, Gennadiy Grigor'yevich and Sukharev, Stanislav Aleksandrovich, candidates of physical and mathematical sciences and laboratory directors at the Atomic Energy Institute imeni I. V. Kurchatov; and Sidorovich, Vladimir Georgiyevich, candidate of physical and mathematical sciences and senior scientific associate at the State Optics Institute imeni S. I. Vavilov; for the series of studies on auto-inversion of a light wave front during forced scattering under hypersonic conditions.

3. Klyshko, David Nikolayevich, doctor of physical and mathematical sciences and professor at Moscow State University imeni M. V. Lomonosov; Penin, Aleksandr Nikolayevich, candidate of physical and mathematical sciences and senior scientific associate; and Fadeyev, Viktor Vladimirovich, candidate of physical and mathematical sciences, docent; they are associates of Moscow State University; for the series of studies "Discovery and Research on the Phenomenon of Parametric Scattering of Light and Its Application in Spectroscopy and Metrology", published between 1966 and 1981.

4. Bogolyubov, Nikolay Nikolayevich, doctor of physical and mathematical sciences and laboratory director at the Mathematics Institute imeni V. A. Steklov of the USSR Academy of Sciences; and Sadovnikov, Boris Iosifovich, doctor of physical and mathematical sciences and senior scientific associate at Moscow State University imeni M. V. Lomonosov; for the series of studies "Mathematical Methods in Statistical Mechanics", published between 1962 and 1975.

5. Kuznetsov, Valeriy Alekseyevich, academician and deputy director of the Geology and Geophysics Institute of the Siberian Department of the USSR Academy of Sciences; Kuznetsov, Yuriy Alekseyevich, academician; both are project supervisors; Dymkin, Aleksandr Mikhaylovich, corresponding member of the USSR Academy of Sciences and director of the Geology and Geochemistry Institute imeni Academician A. N. Zavaritskiy, of the Ural Scientific Center of the USSR Academy of Sciences; Polyakov, Gleb Vladimirovich, corresponding member of the USSR Academy of Sciences and deputy director; Belousov, Anatoliy Fedorovich; Zolotukhin, Valeriy Vasil'yevich; Izokh, Emil' Petrovich; and Sinaykov, Vladimir Ivanovich, all are doctors of geological and mineralogical sciences; Distanov, Elimir Galimzyanovich, candidate of geological and mineralogical sciences; and laboratory directors; Obolenskiy, Aleksandr Aleksandrovich, doctor of geological and mineralogical sciences; Sotnikov, Vitaliy Ivanovich, candidate of geological and mineralogical sciences; they are senior scientific associates and staff at the Geology and Geophysics Institute of the Siberian Department of the USSR Academy of Sciences; Rundkvist, Dmitriy Vasil'yevich, doctor of geological and mineralogical sciences and deputy director of the All-Union Geology Scientific Research Institute imeni A. P. Karpinskiy; for the

series of studies "Magmatic and Endogenic Ore Formations in Siberia", published between 1964 and 1980.

6. Georgiyev, Georgiy Pavlovich, corresponding member of the USSR Academy of Sciences and laboratory director at the Molecular Biology Institute of the USSR Academy of Sciences; Il'in, Yuriy Viktorovich; Ryskov, Aleksey Petrovich; and Skryabin, Konstantin Georgievich, doctors of biological sciences and senior scientific associates; Krayev, Aleksandr Semenovich; Kramerov, Dmitriy Aleksandrovich; Churikov, Nikolay Andreyevich, candidates of biological sciences and junior scientific associates and staff at that same institute; Gvozdev, Vladimir Alekseyevich, doctor of biological sciences and laboratory director at the Molecular Genetics Institute of the USSR Academy of Sciences; Anan'yev, Yevgeniy Vital'yevich, candidate of biological sciences and senior scientific associate at that same institute; and Bayev, Aleksey Aleksandrovich, candidate of biological sciences and senior scientific associate of the General Genetics Institute; for the series of studies "Mobile Genes in Animals", published between 1972 and 1981.

7. Kostyuk, Platon Grigor'yevich, academician and director of the Physiology Institute imeni A. A. Bogomolets of the UkSSR Academy of Sciences and project supervisor; Kryshtal', Oleg Aleksandrovich, doctor of biological sciences; Magure, Igor' Sil'vestrovich, doctor of biological sciences; and Pidoplichko, Vladimir Ivanovich, candidate of biological sciences; senior scientific associates and staff of the same institute; for the series of studies "Research on Ionic Mechanisms of Excitability in the Nerve Cell Soma", published between 1969 and 1981.

8. Emanuel', Nikolay Markovich, academician and deputy director of the Chemical Physics Institute of the USSR Academy of Sciences; Tarusov, Boris Nikolayevich, doctor of biological sciences; both project supervisors; Archakov, Aleksandr Ivanovich; and Vladimirov, Yuriy Andreyevich, doctors of biological sciences and department heads at the 2nd Moscow Medical Institute imeni N. I. Pirogov; Roshchupkin, Dmitriy Ivanovich, doctor of biological sciences and docent at the same institute; Burlakova, Yelena Borisovna, doctor of biological sciences and laboratory director; Neyfakh, Yevgeniy Aleksandrovich, candidate of biological sciences and junior scientific associate; Pal'mina, Nadezhda Pavlovna, candidate of biological sciences and senior scientific associate; staff members of the Chemical Physics Institute of the USSR Academy of Sciences; Kozlov, Yuriy Pavlovich and Kudryashov, Yuriy Borisovich, doctors of biological sciences; Ivanov, Il'ya Il'ich, candidate of biological sciences; laboratory directors at Moscow State University imeni M. V. Lomonosov; and Kagan, Valeriy Yefimovich, doctor of biological sciences and senior scientific associate at the same university; for the series of studies "Physical and Chemical Mechanisms in Free-Radical Peroxide Oxidation of Lipids in Biological Membranes", published between 1954 and 1981.

9. Vagner, Georgiy Karlovich, doctor of art history and senior scientific associate of the Archaelogy Institute of the USSR Academy of Sciences; for the series of studies "The Cultural History of Northeastern Russia in the 12th-15th Centuries", published between 1964 and 1980.

10. Gryaznov, Mikhail Petrovich, doctor of historical sciences and consultant at the Leningrad Department of the Archaeology Institute of the USSR Academy of Sciences, for the series of studies "Antiquities of Southern Siberia", published between 1969 and 1980.

11. Beloded, Ivan Konstantinovich, academician; Palamarchuk, Leonid Sidorovich, doctor of philological sciences and deputy director of the Linguistics Institute imeni A. A. Potebnya of the UkSSR Academy of Sciences; both project supervisors; Rusanovskiy, Vitaliy Makarovich, academician of the UkSSR Academy of Sciences and director of the institute; Buryachk, Andrey Andreyevich; Vinnik, Vasiliy Alekseyevich; Gnatyuk, Galina Makarovna; Golovashchuk, Sergey Ivanovich; Rodnina, Lidiya Alekseyevna; Chertorizhskaya, Tat'yana Kupriyanovna; and Yurchuk, Lidiya Andronovna; candidates of philological sciences and senior scientific associates and staff members of the same institute; Skripnik, Larisa Grigor'yevna, doctor of philological sciences and former department head at the Kiev State Culture Institute; for the 11-volume Ukrainian Dictionary, published between 1970 and 1980.

12. Klibanov, Aleksandr Il'ich, doctor of historical sciences and senior scientific associate of the History of the USSR Institute of the USSR Academy of Sciences; for a series of studies on the history of religion and Russian popular free-thinking between the 14th and 20th centuries, published between 1960 and 1978.

13. Oyzerman, Teodor Il'ich, academician and sector chief at the Philosophy Institute of the USSR Academy of Sciences; Lapin, Nikolay Ivanovich, doctor of philosophical sciences and laboratory director at the All-Union Systems Research Scientific Research Institute; and Kuz'min, Vsevolod Petrovich, doctor of philosophical sciences and board member of the USSR Philosophy Society; for the series of studies "Research on the Formation and Development of the Philosophical Teachings of K. Marx", published between 1974 and 1980.

14. Bochkov, Nikolay Pavlovich, academician of the USSR Academy of Medical Sciences and director of the Medical Genetics Institute of the USSR Academy of Medical Sciences; Zakharov, Aleksandr Fedorovich, corresponding member of the USSR Academy of Medical Sciences and deputy director of the same institute; Prokof'yeva-Bel'govskaya, Aleksandra Alekseyevna, corresponding member of the USSR Academy of Medical Sciences and senior scientific associate of the Molecular Biology Institute of the USSR Academy of Sciences; Davidenkova, Yevgeniya Fedorovna, corresponding member of the USSR Academy of Medical Sciences and former department chief at the Leningrad Institute of Pediatric Medicine; and Pogosyants, Yelena Yervandovna, doctor of biological sciences and laboratory director at the Oncogenesis Scientific Research Institute of the All-Union Cancer Research Center of the USSR Academy of Medical Sciences; for the series of studies researching human chromosomes in normal and pathological states.

15. Tareyev, Yevgeniy Mikhaylovich, academician of the USSR Academy of Medical Sciences; Serov, Viktor Viktorovich, corresponding member of the USSR Academy of Medical Sciences; both are department heads at the First Moscow Medical Institute imeni I. M. Sechenov; Vinogradova, Ol'ga Mikhaylovna, doctor of medical sciences and senior scientific associate; Mukhin, Nikolay Alekseyevich,

doctor of medical sciences and professor; associates of the same institute; Sure, Vladimir Vladimirovich, doctor of medical sciences and department chief at the Central Clinical Hospital of Main Administration No 4 under the USSR Ministry of Health; Rukosuyev, Vadim Sergeyevich, doctor of medical sciences and laboratory director at the Experimental Cardiology Institute of the All-Union Cardiology Research Center under the USSR Academy of Medical Sciences; and Shamov, Ibragim Akhmedkhanovich, doctor of medical sciences and department chief at the Dagestan Medical Institute; for research on the problem of amyloidosis.

16. Kutateladze, Samson Semenovich, academician and director of the Thermal Physics Institute of the Siberian Department of the USSR Academy of Sciences; Nakoryakov, Vladimir Yelifer'yevich, corresponding member of the USSR Academy of Sciences; Pokusayev, Boris Grigor'yevich, doctor of technical sciences; Shreyber, Isaak Ruvimovich, doctor of physical and mathematical sciences; senior scientific associates of the same institute; Nigmatulin, Robert Iskandrovich, doctor of physical and mathematical sciences and laboratory director at the Mechanics Institute of Moscow State University imeni M. V. Lomonosov; Ivandayev, Aleksey Ivanovich and Khabeyev, Nail' Suleymanovich, candidates of physical and mathematical sciences and senior scientific associates of the same institute; Borisov, Anatoliy Aleksandrovich, doctor of physical and mathematical sciences and laboratory director at the Chemical Physics Institute of the USSR Academy of Sciences; Gel'fand, Boris Yefimovich, doctor of physical and mathematical sciences, and Timofeyev, Yevgeniy Ivanovich, candidate of physical and mathematical sciences, senior scientific associates at the same institute; and Kedrinskiy, Valeriy Kirillovich, doctor of physical and mathematical sciences and laboratory director at the Hydrodynamics Institute imeni M. A. Lavrent'yev of the Siberian Department of the USSR Academy of Sciences; for the series of studies "Wave Dynamics of Gas and Liquid Systems", published between 1952 and 1982.

17. Gaponov-Grekhov, Andrey Viktorovich, academician , director of the Applied Physics Institute of the USSR Academy of Sciences, and project supervisor; Flyagin, Valeriy Aleksandrovich, candidate of physical and mathematical sciences, deputy director; Vlasov, Sergey Nikolayevich and Gol'denberg, Arkadiy L'vovich, candidates of physical and mathematical sciences and senior scientific associates; Usov, Valeriy Gennad'yevich, deputy department chief; Agapov, Lev Nikolayevich, laboratory director; Bogdanov, Sergey Dmitriyevich, department chief; Kurbatov, Vadim Ivanovich, chief designer; all associates of that same institute; Razumova, Kseniya Aleksandrovna, candidate of physical and mathematical sciences; and Alikayev, Vladimir Vladimirovich, laboratory directors and associates of the Atomic Energy Institute imeni I. V. Kurchatov; Golant, Viktor Yevgen'yevich, doctor of physical and mathematical sciences and laboratory director at the Physical Technical Institute imeni A. F. Ioffe of the USSR Academy of Sciences; and Cheverev, Nikolay Semenovich, candidate of physical and mathematical sciences and deputy director of the board of the USSR State Committee for Utilization of Atomic Energy; for the series of studies "High-Energy Gyrotrons in a Range of Millimeter Waves and Energy Gyrotron Complexes for Thermonuclear Research", published between 1967 and 1981.

II. In the Area of Technology

1. Vaulina, Anfiya Aleksandrovna, deputy director of the central plant laboratory; and Sekirazh, Valentin Mikhaylovich, director; both employees of the Ural Potassium Dichromate Plant No 1; Zotov, Andrey Vasil'yevich, chief specialist at the Sverdlovsk Affiliate of the State Allied Institute for Planning Basic Chemical Industry Plants; Korneyev, Vitaliy Yefimovich, former director of the All-Union Soda Industry Association; Okulov, Agafon Denisovich, department chief at the Novotroitsk Chrome Compounds Plant; Okhotnikova, Nina Anatol'yevna, central plant laboratory department chief and Tikhonov, Nikolay Zakharovich, brigade leader; employees of the Aktyubinsk Chrome Compounds Plant; Sorokin, German Alekseyevich, former director of that same plant; Ryabin, Viktor Afanas'yevich, doctor of technical sciences and director of the Ural Chemistry Scientific Research Institute and Experimental Plant; Serede, Boris Petrovich, doctor of technical sciences and department chief; Popil'skiy, Mikhail Yakovlevich, candidate of technical sciences and sector chief; and Reshetnikov, Boris Spiridonovich, senior scientific associate; both associates of that same insitute; for the development of progressive methods for obtaining chrome-containing products, which make it possible to produce many tons at a time.

2. Mikhaylov, Yuriy Anatol'yevich; and Sukhodrev, Nina Kuz'minichna, candidates of physical and mathematical sciences and scientific associates; Shikanov, Andrey Sergeyevich, doctor of physical and mathematical sciences; and Fedotov, Sergey Ivanovich, candidate of physical and mathematical sciences; both sector chiefs and associates of the Physics Institute imeni P. N. Lebedev of the USSR Academy of Sciences; Shpol'skiy, Mikhail Refil'yevich, candidate of technical sciences and department chief; Vompe, Aleksandr Fedorovich, doctor of chemical sciences; and Shapiro, Boris Isaakovich, candidate of technical sciences; both are sector chiefs; Uvarova, Natal'ya Valentinovna, candidate of technical sciences and acting sector chief; Zhivilova, Mariya Grigor'yevna, engineer; Krestovnikova, Tamara Ivanovna; and Kheynman, Anatoliy Samoylovich, candidates of technical sciences and senior scientific associates at the Chemical Photographic Scientific Research and Design Institute; for the development and application of photographic materials for astronomy, spectroscopy, and diagnosis of thermonuclear laser plasma.

3. Myasoyedov, Nikolay Fedorovich, doctor of chemical sciences and deputy director of the Molecular Genetics Institute of the USSR Academy of Sciences; Sidorov, Georgiy Vasil'yevich; and Shevchenko, Valeriy Pavlovich; both candidates of chemical sciences; Lavrov, Oleg Vladimirovich; group directors and associates of that same institute; Tupitsyn, Igor' Fedorovich, doctor of chemical sciences and laboratory director; and Mishin, Vyacheslav Ivanovich, candidate of chemical sciences and sector chief; both are associates of the State Applied Chemistry Institute; Grebenik, Anatoliy Mikhailovich, chief engineer; and Prokof'yev, Galina Petrovna, shop superindendent; both are associates of the institute's experimental plant; Kaminskiy, Yuriy Leonovich, candidate of chemical sciences and laboratory director at the Radium Institute imeni V. G. Khlopin; Rumyantseva, Lyudmila Nikolayevna, group director at that same institute; Popova, Gallya Leonidovna, department chief of the USSR State Committee for Utilization of Atomic Energy; and Mikhaylov, Kirill Sergeyevich,

radiochemical engineer; for the development and production of compounds labeled with tritium for use in physical and chemical biology and biotechnology.

4. Ataniyazov, Rakhman, director of the Central Geophysical Expedition; Nikolayev, Anatoliy Andreyevich, chief geologist of the Eastern Geological and Geophysical Expedition; Mirzakhanov, Mirzakhan Kerimkhan ogly, candidate of geological and mineralogical sciences and chief geologist; Chavushyan, Rafik Yegishevich, department chief; and Gavrilov, Yuriy Alekseyevich; associates of the TuSSR Geology Administration; Belen'kiy, Filipp Grigor'yevich;, director; Smirnov, Rostislav Sergeyevich, chief geologist; Shumskiy, Vasiliy Vasil'yevich, drilling foreman; Kolatov, Durdy Aykeshevich, director of services; staff members of the Petroleum Prospecting Expedition of that same Administration; Khodzhakuliyev, Yagshimurad Agamuradovich, corresponding member of the TuSSR Academy of Sciences and director; and Davydov, Alegro Nikolayevich, candidate of geological and mineralogical sciences and party chief; associates of the Turkmen Geological Prospecting Scientific Research Institute; for the discovery and accelerated, highly efficient prospecting of the unique Dauletabad-Donmez gas condensate deposit in the Turkmen SSR.

5. Zhdanov, Yuriy Andreyevich, corresponding member of the USSR Academy of Sciences, rector, and project supervisor; and Gorstko, Aleksandr Borisovich, doctor of physical and mathematical sciences and department chief; both are associates of Rostov State University imeni M. A. Suslov; Vorovich, Iosif Izraylevich, corresponding member of the USSR Academy of Sciences and director; Surkov, Fedor Alekseyevich, candidate of physical and mathematical sciences and deputy director; and Dombrovskiy, Yuriy Anatol'yevich, candidate of physical and mathematical sciences and department chief; they are associates of the Mechanics and Applied Mathematics Scientific Research Institute of that university; Makarov, Eduard Vladimirovich, candidate of biological sciences and director of the Azov Fisheries Scientific Research Institute; Aldakimova, Avgustina Yakovlevna, laboratory director; and Volovik, Stanislav Petrovich, candidate of biological sciences and department chief; they are associates of that same institute; and Bronfman, Aleksandr Moiseyevich, candidate of geographical sciences and department chief at the Marine Hydrophysicis Institute of the UkSSR Academy of Sciences; for the creation of a simulation model of the ecosystem of the Sea of Azov and using the model for systems analysis, forecasting, and management of natural and technical complexes.

6. Sokolov, Georgiy Mikhaylovich, candidate of economic sciences, administrator, and project supervisor; and Gorbach, Zinaida Adamovna, deputy chief bookkeeper; both are associates of the Moscow city office of the USSR Bank for Financing Capital Investments; Voroshin, Aleksey Pavlovich, candidate of technical sciences and director; and Panfilov, Aleksey Borisovich, deputy director; both are associates of the Computer Center at that same office; Belyakov-Bodin, Viktor Igorevich, candidate of technical sciences and department chief at a scientific research institute; Gorskiy, Lev Konstantinovich, doctor of technical sciences, department chief at a scientific research center; and Novitskiy, Aleksey Maksimovich, director of the Main Computer Center of the USSR Bank for Financing Capital Investments; for the creation and implementation of an integrated, automated system for financing and loans for capital construction.

7. Zimon, Il'ya L'vovich, director of the Technical Assistance to Construction Organizations and Enterprises Planning Technological Institute; Kan, Pavel Kharitonovich, candidate of technical sciences and deputy director of the Central Asian Irrigation and Construction of Sovkhozes Main Adminstration; Klemyshev, Yuriy Ivanovich, general director of the "Karshistroyindustriya" [Karshi Construction Industry] Production Association; Likhosherstov, Gennadiy Vasil'yevich, adminstrator of the "Golodnostepirmontazh" [Golodnaya Steppe] Installation Trust; Sivokonev, Pavel Alekseyevich, chief of mobile mechanized column No 16 of the Territorial Land Irrigation and Sovkhoz Construction Administration in Golodnaya Steppe; Madzhidov, Urish Khamidovich, former director of the Land Irrigation and Development Adminstration in Dzhizakskaya Steppe; Mokhovikov, Vladimir Fedorovich, candidate of economic sciences and former administrator of the "Irzharsovkhozstroy" [Irzhar Sovkhoz Construction] and Installation Trust for Industrial and Civil Construction; Palvanov, Dzhaksylyk Palvanovich, candidate of economic sciences and director of the Sovkhoz Irrigation and Construction Administration in the Kara-Kalpak ASSR; Razhobov, Buri, brigade leader of mobile mechanized column No 2 of the "Bustonsovkhozstroy" [Buston Sovkhoz Construction] and Installation Trust for Industrial and Civil Construction; Tsutsman, Nikolay Mikhaylovich, director of the State Central Asian Planning and Research Institute for Planning Civil and Industrial Sovkhoz Construction on Land Being Developed in Central Asian Republics and Kazakhstan; and Khakimov, Meyli, brigade leader of mobile mechanized column No 4 of the "Karshipromzhilstroy" [Karshi Industrial and Housing Construction] and Installation Trust for Industrial and Civil Construction; for the development and implementation of methods for the comprehensive development of desert lands in Central Asia.

8. Oleynikov, Vladimir Dmitriyevich, chief designer; and Markov, Viktor Yegorovich, former general director; both are associates of the Voronezh Grain Cleaning and Drying Machinery Production Association; Grabel'kovskiy, Natan Isaakovich, chief engineer; Polunin, Yuriy Petrovich; and Zhikharev, Sergey Vasil'yevich; both are department chiefs; Savrasov, Boris Alekseyevich, gas and electric welder; they are employed at the Main Specialized Design Bureau of that same association; Morgunov, Anatoliy Aleksandrovich, chief manufacturing engineer at the Voronezh Agricultural Machinery Plant; Alekhin, Ivan Tikhonovich, director of the "Bryansksel'mash" [Bryansk Agricultural Machinery] Plant imeni 60th anniversary of the USSR; Gozman, Grigoriy Isaakovich, candidate of technical sciences and chief manufacturing engineer of an administration of the USSR State Committee for Supply of Production Equipment for Agriculture; Rovnyy, Gennadiy Andreyevich, candidate of technical sciences and department chief at the All-Union Agricultural Machinery Scientific Research Institute imeni V. P. Goryachkin; Aniskin, Vladimir Il'ich, candidate of technical sciences and department chief at the All-Union Mechanization of Agriculture Scientific Research Institute of the All-Union Academy of Agricultural Sciences imeni V. I. Lenin; and Zenishchev, Vadim Andreyevich, mechanical engineer; for the creation and incorporation into agricultural production of machi ery and equipment for over-all mechanization of grain processing at kolkhozes and sovkhozes.

9. Bankovskiy, Yuriy Vladimirovich, department chief; and Gurychev, Stanislav Yevgen'yevich, chief engineer; both are associates of the special design bureau for chiseling machine tools of the Ivanovo Machine Tool Industry Production

Association imeni 50th annivesary of the USSR; Kabaidze, Vladimir Pavlovich, general director; Maslovskiy, Yuriy Vital'yevich, chief engineer; and Chekalov, Boris Antonovich, chief manufacturing engineer; Kostin, Aleksandr Mikhaylovich, leader of fitters' and assemblers' brigade; all are associates of that same production association; Boykov, Konstantin Gavrilovich, chief project designer; and Zykov, Arkadiy Aleksandrovich, candidate of technical sciences and chief engineer; they are associates of the special design bureau for grinding machinery of the Leningrad Machine Tool Industry Production Association imeni Ya. M. Sverdlov; Taller, Boris Nikolayevich, general director; and Polyakov, Valentin Ivanovich, chief manufacturing engineer at the Machine Tool Plant imeni Il'ich; they are associates of that same association; Dzanashvili, Gurami Forevich, candidate of technical sciences and deputy chief of the All-Union Industrial Association for the Production of Roller Bearings; and Firsov, Konstantin Yakovlevich, chief engineer of the All-Union Industrial Association for the Production of Heavy and Unique Machine Tools; for the creation and industrial incorporation of high-efficiency equipment for flexible automated production of complex casing parts and for finishing the rings of high-precision instrument bearings.

10. Bogatov, Nikolay Aleksandrovich, candidate of technical sciences and deputy department chief in the USSR State Planning Committee; Vol'pery, Yuliy Davidovich, candidate of technical science and senior scientific associate of the All-Union Pipe Industry Scientific Research and Design Technological Institute; Yermolyuk, Yuriy Nikolayevich, candidate of technical sciences and sector chief at the All-Union Metallurgical Machine Building Scientific Research Planning and Design Institute; Ivanov, Vladimir Nikolayevich, candidate of technical sciences and department chief at the All-Union High Frequency Currents Scientific Research Planning and Design Institute imeni V. P. Vologdin; Kolesnikov, Valentin Ivanovich, chief project engineer at the Ukrainian State Metallurgical Plant Planning Institute; Lesechko, Vladislav Aleksandrovich, department chief; and Siomik, Aleksandr Konstantinovich, shop superindendent; both are associates of the Vyksa Metallurgical Plant; Medvedev, Aleksandr Nikolayevich, deputy chief engineer; and Ovcharov, Mark Sergeyevich, chief project engineer; both are associates of the "Elektrostal'tyazhmash" [Heavy Steel Electrical Equipment] Production Association; and Skachko, Yuriy Nikolayevich, candidate of technical sciences and senior scientific associate at the Electric Welding Institute imeni Ye. O. Paton of the UkSSR Academy of Sciences; for development and industrial incorporation of the manufacturing process and set of machinery for producing economical oil and gas pipes up to 530 mm in diameter for use on main pipelines.

11. Gorbunov, Gennadiy Vasil'yevich, general director of the Minsk Automatic Line Production Association imeni 60th anniversay of the Great October and project supervisor; Linkevich, Valeriy Yakovlevich, deputy chief engineer; Shpak, Gennadiy Grigor'yevich, shop superindendent; and Bondarchik, Vladimir Vladimirovich; workers at the Minsk Automatic Line Plant imeni P. M. Masherov; Kudyanov, Anatoliy Vasil'yevich, chief engineer; Tatarov, Yuriy Nikolayevich, chief designer; Bortnitskiy, Svyatoslav Ivanovich; and Teleshev, Aleksandr Petrovich, department chiefs; Raptunovich, Aleksandr Solomonovich; and Uzilevskiy, Viktor Semenovich; sector chiefs and asssociates of the Minsk Special Automatic Lines Design Bureau; Galko, Vladimir Grigor'yevich, party committee secretary of the "Minsk Tractor Plant imeni V. I. Lenin" Production

Association; and Zybov, Mstislav Viktorovich, acting technical director of the Gorky Motor Vehicle Plant ("GAZ" Production Association); for creation and industrial incorporation of complexes of automatic lines and special machine tools for mechanical processing of basic components of the working parts of motor vehicles and tractors.

12. Didenko, Aleksandr Markovich, candidate of technical sciences and deputy chief; Yeremenko, Boris Stepanovich, candidate of technical sciences; and Puchkov, Anatoliy Illarionovich; chief designers; Lushchitskiy, Yuriy Vasil'yevich, candidate of technical sciences and laboratory director; all work at the Main Special Design Bureau for Mid-Power Engines of the Kharkov "Serp i molot" [Hammer and Sickle] Engine Building Production Association; Zmiyevskiy, Nikolay Nikiforovich, chief engineer; and Lotorev, Aleksey Fomich, engine tester; both work at that same asssociation; Kostin, Anatoliy Aleksandrovich, chief engineer at the Kharkov Tractor Engine Plant; Petrenko, Konstantin Petrovich, director of the Dergachevskiy Turbine Compressor Plant; Lysenko, Viktor Nikolayevich, chief engineer at that same plant; Povetkin, German Mitrofanovich, candidate of technical sciences and senior scientific associate at the "NATI" [State Allied Tractor Scientific Research Institute] Tractor Building Scientific Production Association; Simson, Al'fred Eduardovich, doctor of technical sciences and department head at the Kharkov Railroad Transport Engineering Institute imeni S. M. Kirov; and Tsayzer, Gerbert Georgiyevich, candidate of technical sciences and chief engineer at the "Chelyabinsk Tractor Plant imeni V. I. Lenin" Production Association; for development and assimilation into mass flow-line production of tractor and combine diesel engines with increased power and economy and efficient gas-turbine supercharging systems.

13. Agafonov, Valentin Grigor'yevich, chief engineer at the Latvian Maritime Steamship Company; Androsov, Viktor Yakovlevich, mechanic and instructor at the Novorossiysk Maritime Steamship Company; Dranitsyn, Sergey Nikitich, doctor of technical sciences and deputy director of the Central Maritime Fleet Scientific Research Institute; Bol'shakov, Valentin Filippovich, candidate of technical sciences and sector chief at that same institute; Vakhrameyevich, Yuriy Zosimovich, chief of services at the Black Sea Maritime Steamship Company; Malanyuk, Yevgeniy Anisimovich, chief engineer at the Baltic Central Planning and Design Bureau with Experimental (Test) Production; Mitusova, Tamara Nikitovna, candidate of technical sciences and sector chief at the All-Union Petroleum Refining Scientific Research Institute; Rayevskaya, Yevgeniya Andreyevna, senior engineer at the All-Union Association for Shipbuilding and Fleet Technical Maintenance and Repair; Solodukhin, Valentin Mikhaylovich, deputy shop superintendent at the Odessa Ship Repair Works imeni 50th anniversary of the Soviet Ukraine; Sal'nikov, Yevgeniy Semenovich, department chief at the Far Eastern Maritime Steamship Company; Samoylov, Gennadiy Fedorovich, senior mechanic on the "Kovda", a vessel of the Northern Maritime Steamship Company; and Tsvetkov, Oleg Sergeyevich, department chief at the Baltic Maritime Steamship Company; for development and assimilation in maritime transport of a complex of new technical equipment and processes that provide a saving of all types of fuel and power resources.

14. Azarov, Aleksey Danilovich, laboratory director; Ivashchenko, Aleksandr Vasil'yevich, doctor of chemical sciences; and Minkin, Lenonid Kondrat'yevich;

department chiefs; Serov, Boris Yakovlevich, chief engineer; and Titov, Viktor Vasil'yevich, doctor of chemical sciences and director; associates of a scientific research institute; Bekichev, Vyacheslav Ivanovich, candidate of physical and mathematical sciences and laboratory director at a scientific production association; Gorfinkel', Boris Isaakovich, candidate of technical sciences and head of a plant experimental design bureau; Sevost'yanov, Vladimir Petrovich, candidate of chemical sciences; and Sukhariyer, Ayzik Samuilovich, candidate of technical sciences; both are laboratory directors at that same experimental design bureau; Yekimov, Yevgeniy Gavrilovich, general director of a production association; Tsarev, Valeriy Pavlovich, chief plant engineer; and Tsvetkov, Viktor Nikolayevich, corresponding member of the USSR Academy of Sciences and laboratory director at the High Molecular Compounds Institute of the USSR Academy of Sciences; for the development of indicator devices, organizing their production, and incorporating them into the USSR national economy.

15. Aliyev, Rafik Aziz ogly, doctor of technical sciences and rector of the Sumgait Higher Technical Educational Institution, a branch of the Azerbaijan Petroleum and Chemistry Institute imeni M. Azizbekov; Ter-Khachaturov, Arkadiy Ambartsumovich, doctor of technical sciences and professor; Ibragimov, Ismail Ali ogly, academician of the AzSSR Academy of Sciences and rector; Aliyev, Tofik Mamedovich, corresponding member of the AzSSR Academy of Sciences and department head; Krivosheyev, Vladimir Petrovich, candidate of technical sciences and senior instructor; and Efendiyev, Israyyl Rustam ogly, candidate of technical sciences and docent; associates of that same institute; Berezovskiy, Valeriy Aleksandrovich, candidate of economic sciences and deputy director of Petroleum Refining and Petrochemical Industry Scientific Research and Planning Institute; Guseynov, Abdulguseyn Mamed Dzhafar ogly, candidate of chemical sciences and director of the Novobaku Petroleum Refining Plant imeni Vladimir Il'ich; Guseynov, El'man Alikuli ogly, shop superintendent; and Ismaylov, Akhmed Akhad ogly, candidate of technical sciences and director of the data and computer center; employees of that same plant; and Ulanov, Georgiy Mikhaylovich, doctor of technical sciences and laboratory director at the Control Problems Institute (Automation and Remote Control); for the development and introduction of control and information systems for increasing the efficiency of production in the petroleum refining industry in the Azerbaijan SSR.

16. Baranov, Aleksandr Serafimovich, department chief at a machine building plant; Gritsenko, Vladimir Il'ich, candidate of technical sciences and deputy director of the Cybernetics Institute imeni V. M. Glushkov of the UkSSR Academy of Sciences; Zabolotnyy, Viktor Ivanovich; and Rukhlyadev, Yuriy Nikolayevich; chief project designers; Moroz, Sergey Semenovich, sector chief; and Siverskiy, Pavel Mikhaylovich, candidate of technical sciences and division chief; associates of a special design bureau at that same institute; Konovalov, Vladimir Nikolayevich, candidate of technical sciences and senior scientific associate at the State Civil Aviation Scientific Research Institute; Korol', Radomir Stepanovich, ministry administration director; Makhon'kin, Yuriy Yemel'yanovich, candidate of technical sciences and division chief at the scientific research institute; Chuyenkov, Valeriy Ivanovich, sector chief at that same institute; and Papchenko, Oleg Mikhaylovich, candidate of technical sciences and deputy department chief at a machinery plant; for the development

and broad incorporation into the national economy of a highly productive automated system for processing aircraft equipment test results.

17. Aleksandrov, Nikolay Vasil'yevich, doctor of technical sciences; and Khval'kovskiy, Aleksey Vasil'yevich, candidate of technical sciences; both are senior scientific associates; Petrashko, Aleksey Ivanovich, candidate of technical sciences and director; Ogon'kov, Vyacheslav Grigor'yevich, candidate of technical sciences and department chief; Berezin, Vitaliy Borisovich, group chief; and Kukul'skaya, Aleksandra Nikolayevna, impregnation specialist; associates of the All-Union Electrical Insulation Materials and Foil Dielectrics Scientific Research and Planning Technological Institute; Bobylev, Oleg Vasil'yevich, chief engineer at the "Elektroizolit" [Electrical Insulation] Production Association; Borzov, Vladimir Grigor'yevich, chief engineer at the Nizhneudinsk Mica Factory of the "Irkutskslyuda" [Irkutsk Mica] Production Association; Kuz'min, Aleksandr Illarionovich, director of the Balashov Mica Combine; Shologon, Ivan Mikhaylovich, candidate of chemical sciences and deputy director of the Ukrainian Plastics Scientific Research Institute; Vinogradova, Raisa Nikolayevna, gluing specialist at the Naro-Fominsk Electrical Insulation Materials Plant; and Sushkova, Inna Timofeyevna, candidate of technical sciences; for the development and introduction into the national economy of a wide range of electrical insulation materials based on micanite paper.

18. Ablyazov, Vladimir Sergeyevich, candidate of technical sciences and department head at a special design bureau of the Radio Engineering and Electronics Institute of the USSR Academy of Sciences; Armand, Neon Aleksandrovich, doctor of technical sciences and deputy director; and Shutko, Anatoliy Mikhaylovich, candidate of technical sciences and senior scientific associate; they are associates of that same institute; Yegorov, Sergey Tikhonovich, doctor of technical sciences and laboratory director at the scientific research institute; Yemel'yanov, Valentin Aleksandrovich, doctor of agricultural sciences and department head; and Leonidov, Vladimir Aleksandrovich, candidate of technical sciences and laboratory director; they are associates of the All-Union Hydraulic Engineering and Land Reclamation Scientific Research Institute imeni A. N. Kostyakov; Inyutkin, Igor' Ivanovich, candidate of technical sciences and department head at the All-Union Use of Civil Aviation in the National Economy Scientific Research Institute; Kondrat'yev, Kirill Yakovlevich, corresponding member of the USSR Academy of Sciences and department head at the Main Geophysical Observatory imeni A. I. Voyeykov; Shul'gina, Yevgeniya Mikhaylovna, candidate of physical and mathematical sciences and senior scientific associate at that same observatory; Sazonov, Nikolay Vladimirovich, candidate of technical sciences and deputy director of the Automated Data Control System for Agricultural Resources at the All-Union Cybernetics Scientific Research and Planning Technological Institute; and Basharinov, Anatoliy Yevgen'yevich, doctor of technical sciences; for developing the scientific foundations for a remote high-frequency radiometric method and using it for operational determination of soil moisture and ground water levels.

19. Alekseyev, Oleg Vasil'yevich, doctor of technical sciences and department head at the Leningrad Electrical Engineering Institute imeni V. I. Ul'yanov (Lenin); Atserov, Yuriy Sergeyevich, chairman of the All-Union Electronic Radio Navigation and Satellite Communications Association; Bekhterev, Andrey

Petrovich, sector chief of the Leningrad Production Association imeni Kozitskiy; Pavlenko, Mikhail Aleksandrovich, deputy director; and Kravchenko, Leonid Yakovlevich, radio equipment regulator; they are all plant employees; Kalyuzhnyy, Igor' Leonidovich, chief engineer; and Chernitskiy, Aleksandr Alekseyevich, department chief; they are both associates of the design bureau of that same plant; Marynchak, Vasiliy Sergeyevich, chief of a ministry administration; Khitrov, Valentin Ivanovich, deputy chief engineer at the design bureau; and Shchepanovskiy, Arnol'd Anatol'yevich, department chief of the USSR Ministry of the Fish Industry; for developing, organizing production of, and re-equipping the fleet with efficient shortwave radio broadcasting equipment.

20. Antonyuk, Ivan Filimonovich, administrator of the All-Union State Specialized Trust for the Construction and Installation of Radio and Television Equipment and Radio Relay Communication Lines; Dezhurnyy, Igor' Ivanovich, candidate of technical sciences and department chief of the Voronezh "Elektrosignal" [Electrical Signal] Production Association; Kuz'min, Vladimir Mikhaylovich, laboratory director; Klimchuk, Vladimir Aleksandrovich; and Fomin, Oleg Dmitriyevich; both are sector chiefs; Popova, Tat'yana Stepanovna, installation worker; and Ponomarenko, Vladimir Aleksandrovich, design engineer first grade; they are employees of that same association; Luk'yanova, Ol'ga Leonidovna, department chief at the Kuybyshev Branch of the State Radio Scientific Research Institute; Markovskiy, Ivan Vasil'yevich, chairman of the kolkhoz imeni Michurin, in Krasnoarmeyskiy rayon, Krasnodar Kray; Shkud, Moisey Abramovich, chief specialist at the State Allied Planning Institute; and Kripaytis, Valentin Aleksandrovich, deputy minister; for the creation, series production, and incorporation into the national economy of a complex of ultra-shortwave radio equipment for communicating with mobile objects.

21. Agoshkov, Mikhail Ivanovich, academician and department head at the Problems of Complex Utilization of Mineral Resources Institute of the USSR Academy of Sciences; Bochkarev, Boris Nikolayevich, chief engineer; Panfilov, Yevgeniy Ivanovich, candidate of technical sciences and laboratory director; Terpogosov, Zaven Aleksandrovich, doctor of technical sciences; Ryzhov, Vladimir Petrovich; and Shitarev, Vadim Georgiyevich; both are candidates of technical sciences and senior scientific associates; and Sindarovskiy, Natal'ya Nikolayevna, senior engineer; they are associates of that same institute; Vinogradov, Vladimir Samoylovich, deputy minister of the USSR Ministry of Ferrous Metallurgy; Gleyzer, Maks Isaakovich, candidate of technical sciences and deputy laboratory director at the All-Union Mining Geomechanics and Surveying Scientific Research Institute; Rozhchenko, Yevgeniy Nikolayevich, deputy minister of the USSR Ministry of the Coal Industry; Iofin, Stanislav Leonidovich, doctor of technical sciences and director of the All-Union Ferrous Metallurgy and Mining Scientific Research, Planning and Design Institute; and Simakov, Vladimir Alekseyevich, doctor of technical sciences and department head at the Moscow Geological Prospecting Institute imeni Sergo Ordzhonikidze; for developing the scientific foundations for rational extraction of solid mineral reserves and incorporation of the results into the mining industry.

22. Varnachev, Yevgeniy Andreyevich, general director and project supervisor; Munarev, Yuriy Stepanovich, shop superintendent; and Starikov, Stanislav Grigor'yevich, senior foreman; they are employees of the "Uralmash" [Ural

Machinery] Production Association; Mochalov, Lev Danilovich, design bureau chief; and Pleshkov, Petr Pavlovich, chief project engineer; they are associates of the Heavy Machine Building Scientific Research Institute of that same association; Arkhangel'skiy, Vladislav Leonidovich, candidate of technical sciences and chief designer in an administration department of the Ministry of the Petroleum Industry; Safiullin, Midkhat Nazifullich, candidate of technical sciences and deputy chief of the Tyumen Petroleum and Gas Industry Main Production Administration; Voyevod, Aleksandr Nikoforovich, department chief; and Agafonov, Veniamin Maksimovich, drilling foreman at Surgut Drilling Operations Administration No 1; they are employees of that same Main Administration; Mishchevich, Viktor Il'ich, candidate of technical sciences and department chief of the USSR State Committee for Science and Technology; Sivak, Vladimir Nikiforovich, deputy chief of an administration of the "Yuganskneftegaz" [Yugansk Petroleum and Gas] Production Association; and Tsaregradskiy, Yuriy Petrovich, department head at the All-Union Petroleum Machinery Building Scientific Research, Planning and Design Institute; for the development and industrial assimilation of the BU 3000 electronically controlled drilling apparatus for building groups of wells, which makes it possible to increase the rate of drilling operations and the extraction of petroleum in Western Siberia.

23. Kipko, Ernest Yakovlevich, doctor of technical sciences, general director, and project supervisor; Polozov, Yuriy Arkad'yevich, candidate of technical sciences and deputy general director; Lagunov, Vladimir Andreyevich, candidate of technical sciences and expedition chief; Popov, Igor' Valer'yevich, deputy expedition chief; and Lushnikova, Oksana Yur'yevna, candidate of technical sciences and chief expedition engineer; they are associates of the Specialized Geological Production Association for Tamping and Geological Survey Operations; Ivachev, Leontiy Mikhaylovich, candidate of technical sciences and department head at the Donetsk Polytechnical Institute; Nasonov, Il'ya Dmitriyevich, doctor of technical sciences and professor at the Moscow Mining Institute; and Salamatov, Mikhail Antonovich, candidate of technical sciences and department head at the Sverdlovsk Mining Institute imeni V. V. Vakhrushev; for the development and introduction of a new complex method for tamping water-filled rock under complicated mining and geological conditions.

24. Akovantsev, Anatoliy Ivanovich, finishing and grinding specialist; Koshurin, Aleksandr Vyacheslavovich, candidate of technical sciences and general director; Chuvashov, Yuriy Nikolayevich, candidate of technical sciences and deputy general director; Nikiforov, Aleksandr Mikhaylovich, chief engineer; Petrovich, Nikolay Yefimovich, press operator; and Yadykin, Yevgeniy Pavlovich, mechanical engineer; they are employees of the Leningrad "Krasnyy vyborzhets" [Red Vyborger) Nonferrous Metals Processing Production Association; Kasatkin, Nikolay Ivanovich, candidate of technical sciences and dean at the All-Union Machine Building Correspondence Institute; Belov, Vyacheslav Georgiyevich, senior instructor at that same institute; Shevakin, Yuriy Fedorovich, doctor of technical sciences and director of the State Nonferrous Metal Alloys and Processing Scientific Research, Planning and Design Institute; Rytikov, Aleksandr Mikhaylovich, doctor of technical sciences and deputy

director of that same institute; Strakhov, Gennadiy Nikolayevich, director of the All-Union Nonferrous Metals Processing Industrial Association; and Zhukevich-Shoste, Nikolay Yevgen'yevich, candidate of technical sciences and senior scientific associate at the All-Union Metallurgical Machine Building Scientific Research, Planning and Design Institute; for development of a complex processing method for and assimilation of production of economical, hollow rolled metal structures made of copper and copper alloys.

25. Gotin, Valeriy Nikolayevich, senior scientific associate and project supervisor; and Shalimov, Anatoliy Georgiyevich, doctor of technical sciences and deputy director; both are associates of the Ferrous Metallurgy Central Scientific Research Institute imeni I. P. Bardin; Vinogradov, Vitaliy Mikhaylovich, candidate of technical sciences and general director of the Automation of Ferrous Metallurgy Scientific Production Association; Pirozhnik, Viktor Yevgen'yevich, candidate of technical sciences and laboratory director at that same association; Kosyrev, Lev Konstantinovich, candidate of technical sciences and former chief engineer at the "Electrostal'" [Electrical Steel] Electrical Metallurgy Plant imeni I. F. Tevosyan; Zhitkov, Nikolay Konstantinovich, candidate of technical sciences and director of a laboratory group; and Zinyayev, Nikolay Ivanovich, steel foundery worker; they are employed at that same plant; Puchkov, Lev Mikhaylovich, director of the Zlatoust Metallurgical Plant; Maksutov, Rashat Faskheyevich, chief engineer at the Chelyabinsk Metallurgical Plant; Gorin, Vladimir Aleksandrovich, candidate of technical sciences and sector chief at the All-Union Aviation Materials Scientific Research Institute; and Tregubenko, Igor' Aleksandrovich, senior foreman at the "Dneprospetsstal'" [Dnepr Special Steel] Electrical Metallurgy Plant imeni A. N. Kuz'min; for development and introduction of a new processing method for vacuum arc smelting of high-alloy steel and other important alloys.

26. Alidzhanov, Ali Khalilovich, deputy chairman of the executive committee of the Novosibirsk City Council of People's Deputies; Borodanov, Mikhail Matveyevich, chief of the Tyumen Construction and Installation Association for the Construction of Railroads in Western Siberia; Zhukov, Yevgeniy Mikhaylovich, administrator of the Surgut Specialized Trust for Hydromechanical Operations in Transport Construction; Melkonov, Semen Stepanovich, deputy minister of transport construction; Morits, Ernest Yakovlevich, chief administration engineer in that same ministry; Skvortsov, Viktor Mikhaylovich, chief of the Sverdlovsk Railroad; Solokhin, Valentin Fedorovich, administrator of Bridge Construction Trust No 11 of the Bridge Construction Main Administration; Chepurkin, Vasiliy Vasil'yevich, administration chief of the Ministry of Railways; Yakubov, Anatoliy Aleksandrovich, chief department specialist at the Siberian State Transport Construction Planning and Research Institute; and Korotchayev, Dmitriy Ivanovich, honored construction worker of the RSFSR; for development and introduction of progressive technical solutions that made it possible to accelerate the construction of railroads in the petroleum and gas-rich regions of Tyumen Oblast.

27. Baskakova, Valentina Grigor'yevna, deputy chief engineer at the Latvian State Urban Construction Planning Institute; Strauts, Valdis Martynovich, chief engineer at the "Rigadorremstroy" [Riga Road Construction and Repair] Specialized Road Repair and Construction Production Trust; Tsarikovskiy, Igor' Fedorovich, chief engineer; Fandeyev, Ivan Ivanovich, department chief at the

specialized design bureau; and Starokadomskiy, Sergey Mikhaylovich, department chief at Bridge Construction Trust No 5; they are employees of the Bridge Construction Main Administration; Kondurov, Valentin Sergeyevich, chief; and Dmitriyev, Vladimir Alekseyevich, former chief engineer; both are employees of Bridge Detachment No 17 of that same Main Administration; Royzman, Isaak Borukhovich, candidate of technical sciences and laboratory director at the All-Union Transport Construction Scientific Research Institute; and Fuks, Georgiy Borisovich, chief project engineer at the Kiev Affiliate of the State Highway Research and Planning Institute; for a complex of engineering structures along the bridge route across the Daugava River in the city of Riga.

III. Textbooks

For Higher Education Institutions

1. Vinogradov, Ivan Matveyevich, academician; for the textbook "Osnovy teorii chisel" [Foundations of Number Theory], published in 1981 (9th edition).

2. Rzhevskiy, Vladimir Vasil'yevich, academician and rector of the Moscow Mining Institute; for the textbooks "Protsessy otkrytykh gornykh rabot" [Processes of Open Mining Operations] and "Tekhnologiya i kompleksnaya mekhanizatsiya otkrytykh gornykh rabot" [The Technology and Over-All Mechanization of Open Mining Operations], published in 1978 and 1980 (3rd edition).

For Secondary School

Maksimov, Nikolay Aleksandrovich, editor-in-chief of the journal GEOGRAFIYA V SHKOLE, for the 5th-grade textbook "Fizicheskaya geografiya" [Physical Geography], published in 1981 (14th edition).

For the Party Education System and Economic Education

Afanas'yev, Viktor Grigor'yevich, academician and editor-in-chief of the newspaper PRAVDA, for the textbook "Osnovy filosofskikh znaniy" [Foundations of Philosophical Knowledge], published in 1981 (12th edition).

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TECHNOLOGICAL CHANGE IN HEAVY, TRANSPORT MACHINEBUILDING

Moscow VESTNIK MASHINOSTROYENIYA in Russian No 6, Jun 83 pp 3-8

[Article by R. N. Arutyunov, first deputy minister of heavy and transport machinebuilding, USSR State Prize Laureate: "The Main Lines of Technical Progress"]

[Text] Machinebuilding has a decisive role to play in the speedy application of the most recent advances of science and technology to production.

"We possess a large reserve in the economy," Comrade Yu. V. Andropov, general secretary of the CPSU Central Committee, remarked in his speech at the November (1982) Plenum of the CPSU Central Committee. "This untapped potential has to be sought out in speeding up scientific-technical progress and in the extensive and rapid application of the advances of science, technology and progressive know-how to production."

For personnel in the branch of heavy and transport machinebuilding embodiment of the branches of science and technology in machines, equipment and manufacturing processes is the main production policy and scientific-technical policy. The branch's plans for economic and social development are drafted on the basis of those advances. They are taken into account in drafting the comprehensive scientific-technical target programs. Today the ministry is participating in 50 comprehensive target programs and bears the principal responsibility for the performance of five programs for the subbranches of metallurgical, mining and materials-handling machinebuilding and for diesel locomotive, railroad car and diesel engine building.

In metallurgical machinebuilding equipment is being created and perfected in the direction of a further increase in its capacity and productivity, and also in the direction of higher reliability and economic efficiency. In 1982 a blooming mill for continuous teeming of "bloom" with a section 300 x 360 mm was created for the Oskolskiy Electric Metallurgical Combine imeni L. I. Brezhnev. In mining machinebuilding machines and equipment have been put into industrial production to mechanize processes of coal and mineral mining: the ESh-40.85 walking excavator for operation under northern conditions and the ERP-5250 VS rotary stripping excavator. In materials-handling machinebuilding production has been organized of cranes for various purposes and dockside container conveyors with a load capacity of 32 tons for riverports

and seaports. In transport machinebuilding production has begun of two-section diesel freight locomotives with a capacity of 8,000 HP, diesel passenger locomotives with a capacity of 4,000 HP per section, the VS-140 and 7VS-60 dump cars for moving excavated material at strip mines and railroad cars with sliding-gate loading hatches for carrying grain. Further work has been done in diesel enginebuilding to increase the operating life of diesel engines, and to reduce fuel and lubricant consumption. DC diesel generators have been manufactured with a capacity of 600 kw, and also marine diesel-reducer units with 800-HP diesel engines.

In 1982 12 models of outdated machines and equipment were withdrawn from production and 86 new designs put into production. Associations, enterprises and institutes of the ministry participated in carrying out 130 assignments involved in fulfillment of comprehensive programs. The branch's technical policy is aimed above all at increasing unit capacity, reliability and durability of machines while at the same time reducing their dimensions and weight and actual and specific metals intensiveness. As a rule 1,000 new models of machines and equipment are put into series production and modernized during each 5-year period. An important line of our activity is the creation of large machine complexes making it possible to mechanize to the maximum complicated technological processes in metallurgy, mining, transportation and other spheres of production.

Metallurgy is a traditional subbranch of heavy industry.

In 1982 the first domestic charging device without a bell was installed on a blast furnace with a volume of 2,000 cubic meters at the Krivoy Rog Metallurgical Plant imeni V. I. Lenin. Installing these devices on furnaces will make it possible to increase furnace productivity by 2 percent and to reduce coke consumption by 3 percent. A one-of-a-kind mixer with a capacity of 600 tons has been created by the Kramatorsk machinebuilders for the Cherepovets Metallurgical Plant imeni 50 letiye SSSR for moving, holding and diluting the molten iron. New methods have been mastered for making metal and for making products from it. In particular, wider use is being made of the converter method in which steel is made by vacuum processing outside the furnace and teeming with continuous casting machines. The "Zhdanovtyazhmash" Production Association has organized the manufacture of 400-ton oxygen converters. Existing converters are being replaced by the converters with larger capacity. A pair of such units processes 5 million tons of metal per year. They more than double labor productivity in metallurgy by comparison with even the largest of their predecessors.

Two- and four-channel machines for continuous casting of curved and radial ingots used to obtain slabs from 200 to 1,900 mm wide, which are manufactured by the "Uralmash" Association and the Yuzhnouralsk Machinebuilding Plant, are being widely adopted in our country. The output of ingots of the continuous casting machine is doubled. Units with an output of 1.25 million tons per year are being manufactured to replace units for pouring carbon steel with an average output of 900,000 tons per year. The ingots obtained from them are distinguished by high quality and metal loss in subsequent treatment is reduced.

A method of shaping the ingot in the horizontal plane instead of the vertical one is a fundamentally new solution in the technology of casting steel. The quality and structure of the ingot are improved, and waste is produced in its subsequent processing. Experience in the use of these machines at Soviet metallurgical enterprises has shown that the actual output of each of them exceeds 1 million tons of ingots per year, while the rated output is 800,000 tons, and at the same time the new machines reduce the cost of slabs by 10-12 percent and raise labor productivity 28 percent.

The well-known method of rolling nonferrous metals directly from the molten metal has been improved. The innovation is that the molten metal is fed into the space between the rollers from below through a tundish. Several mills of this design have been created to produce aluminum strip up to 1,000-1,600 mm wide and 3-8 mm thick. There are similar mills for rolling aluminum and copper wire. As a rule labor productivity on these mills is increased 4-5-fold, while specific capital investments are reduced to approximately one-fourth.

The problem of combining casting and rolling is more complicated for steel, since steel's crystallization rate is lower than the usual rolling speed. A unit for continuous production of small shapes from alloy steels by the continuous method is now in full-scale trial operation at the "Elektrostal'" Plant imeni Tevosyan. Its operation has shown that in spite of the reduced rolling speed, this method is advantageous because the process is continuous. Losses of metal are reduced, and the quality of the product is improved.

Units for vacuum processing of molten steel, which makes it possible to considerably improve the quality of the steel produced, are being manufactured in larger numbers. The first prototypes have been made of combined units for argon-oxygen refining of molten steel. Equipment is being put into production to make metal powders by the atomization method.

Rolling mills designed by VNIIMETMASh [All-Union Order of Lenin Scientific Research and Design Engineering Institute for Metallurgical Machinebuilding] for cold rolling of pipe have become very well known. Now a new and improved process has been developed for production of cold-rolled thin-wall tubing. Piece rolling (detaleprokatnyye) mills have become widespread in our country; economical workpieces for making pinions, sprockets, shafts, axles, and wheels can be made on them; an example is the "250" rolling mill for production of railroad car axles. Instead of the traditional forging, the axles are produced on the new mill by the method of helical rolling, which makes it possible to reduce the weight of the billet by 40-50 kg and as a result to save about 20,000 tons of metal per year.

The process of rolling solids of revolution in screw sizes has come to be widely applied in the production of metal balls. Soviet ball-rolling mills are operating successfully in England, West Germany, Sweden and Brazil. At enterprises of Mintyazhmash [Ministry of Heavy and Transport Machinebuilding] one-of-a-kind pipe welding units have been created. The new process of pipe welding is continuous. The rate of output of the finished product has been increased considerably.

One of the important lines of activity of the branch is to create reliable equipment with high output for the mining industry. At the present time there is a trend in the industrially advanced countries for coal-mining and other mining equipment to develop at a faster than average pace. The demand has risen for tunneling combines, conveyors and crushing equipment. Large ESh-100/100 walking excavators with a bucket capacity of 100 cubic meters and a boom length of 100 meters are being manufactured at "Uralmash" for the country's strip mines. In 1 minute the machine moves 180 tons of rock a distance of 200 meters. The excavator's output is more than 16 million cubic meters of rock per year.

Rotary complexes with an output between 630 and 5,250 cubic meters of rock per hour are being manufactured at the branch's plants. Their use is making it possible to fully mechanize the entire process of coal mining.

In connection with the increased mining of minerals, construction of the Krasnoyarsk Heavy Excavator Plant is taking on major importance; the first phase of the plant will begin to manufacture quarry shovels with a bucket capacity of 12.5 cubic meters, walking draglines, and rotary complexes with an output of 5,250 cubic meters per hour. In view of the importance of the new construction project, the Ministry of Heavy and Transport Machinebuilding was the initiator of speeding up the pace of construction at the beginning of last year. It was supported by two departments doing basic construction work as contractors--USSR Mintyazhstroy [Ministry of Construction of Heavy Industry Enterprises] and USSR Minmontazhspetsstroy [Ministry of Installation and Special Construction Work]. Plans were drawn up to shorten the construction time to ten-seventeenths of what it was by combining the stages of project planning and construction. In other words, assuming the full complement of construction equipment and building materials, construction in strict accordance with the comprehensive schedule ought to have been guaranteed. But unfortunately the smooth and planned pace of progress at this construction site is constantly being disrupted, and deadlines for delivery of parts of the project are hardly being met anywhere. A number of causes having to do with production, worker facilities at the construction site and social problems are involved here. The organization of work is in need of the speediest improvement. Given the constant shortage of trained workers in the construction industry, there have been large losses of worktime because brigades were not given work to do, because of shortages of building materials or machinery, because of the unsatisfactory performance of transportation, and because of poor organization of competition among construction and installation brigades.

Given the way the job has been organized, the quality of work performed is also suffering, and there have been flagrant departures from the project plan and from construction norms and technical specifications. The lack of railroad sidings, freight-handling equipment, storehouses and storage areas, and signaling and communications systems, abnormal conditions have been created for receiving, inspecting and storing incoming equipment, instruments and materials. Glavkrasnoyarskstroy has been building housing, stores, restaurants, schools, kindergartens and hospitals at an intolerably low pace.

These shortcomings are the result of major lapses by our contractor.

In his speech at the November (1982) Plenum of the CPSU Central Committee Comrade Yu. V. Andropov, general secretary of the CPSU Central Committee, emphasized: "Nor are we satisfied in large part by the way construction work itself is organized. The shortcomings that have existed there from year to year are causing nonfulfillment of plans for activation of capacities."

At this time, when the party is orienting industrial workers toward an approach in which they show initiative and creativity and a great organizational effort at all levels of production, USSR Mintyazhstroy and other related departments must take into account past mistakes with full responsibility and work out an effective set of interrelated measures to bring construction of the Krasnoyarsk Heavy Excavator Plant up to the planned level. Especially since an important organizational effort has been purposefully pursued in that direction for a long time now.

Sets of interrelated machines consisting of drills, loaders and tunneling cars have been created to automate underground mining methods. Large-capacity loading conveyors, vibrators and self-propelled rail cars are being used in face operations. Use of the new machines has made it possible to double the labor productivity of miners. A new generation of rotary cutters is being developed in the branch. They operate automatically in sinking shafts between 19 and 55 meters deep and 250 mm in diameter. This equipment is equal in its parameters to any similar machine in the world. Circular-flow technology is becoming more and more widespread in mining operations. The first prototype of a complex consisting of a crusher, endless belt loader and conveyor, all of which are self-propelled, has been installed at the Kachkanar Mining and Ore-Dressing Combine imeni Sverdlovsk. This complex crushes and conveys the rock from the face to the ore-dressing mill, bypassing the first crushing station at the ore-dressing mill.

Definite qualitative shifts have also been outlined in the creation of equipment for mining and ore dressing. The production association "Uralmash" is carrying on projects to perfect the design of gyratory crushers. The new crushers make it possible to obtain a finer product in one stage of crushing than the present gyratory crushers for fine reduction. Ball mills whose drums have a capacity of 140 cubic meters, ore pebble mills with a capacity of 160 cubic meters, and flotation machines with a chamber capacity of about 12 cubic meters are also being delivered to the branch for mining and ore-dressing combines in ferrous and nonferrous metallurgy.

Efficient electromagnetic separators have been created with an output of 100 tons per hour for enrichment of weakly magnetic ores. A line of roasters with a sintering area ranging from 306 to 520 square meters is being manufactured. "Uralmash" has created the OK-620 conveyors with a sintering area of 620 square meters, whose productivity is 416 tons per hour in sintering pellets. These are the largest sintering machines in the world.

In order to mechanize materials-handling operations plants in the branch are manufacturing overhead traveling cranes with remote control, portal cranes, overhead pusher bar conveyors, automatic stacker cranes for use with racks and bins, machines for loading and unloading piece freight, etc.

The Soviet Union holds the world lead in the manufacture of diesel locomotives. Plants in the branch are manufacturing a line of diesel locomotives in one-, two- and three-section versions with capacities from 1,000 to 4,000 HP per section. These machines can operate both under the conditions of the tropics and also above the Arctic Circle. The well-known M62 diesel road locomotive, with a capacity of 2,000 HP, and the TE-109 with a capacity of 3,000 HP, are being operated successfully abroad.

Experimental prototypes have been built of a two-section diesel freight locomotive with a capacity of 8,000 HP and a passenger locomotive with a capacity of 6,000 HP. These machines are economical in operation, many control processes have been automated, the weight has been reduced, and the traction and speed characteristics have been improved. Highly economical four-stroke diesel engines are installed in the locomotives, which use electric AC-DC transmission, regenerative braking, and regulated electric drive of auxiliary equipment. Up-to-date electric transmission, thyristor devices, electric brakes, and electronic systems for regulating engine operation are used on the TEM-7 switching locomotives. This locomotive is capable of moving and braking up trains weighing up to 5,000-6,000 tons.

Highly productive track-laying cranes, straightening and aligning machines, and ballast-clearing machines are being manufactured for track maintenance and repair.

In addition to comfortable passenger cars, high-speed suburban electric motor trains, and subway cars, plants in the branch are manufacturing a wide assortment of long-distance railroad freight cars. The branch faces the task of faster output of specialized freight cars with higher carrying capacity: a tank car to carry petroleum products, cars to carry sheet metal, grain, flour and polymer materials, paper in rolls, fertilizers, and flatcars for carrying large containers. Among the other interesting models one might mention the 16-wheel tipper cars for mining operations with a carrying capacity of 145-165 tons and improved unloading systems. Foreign countries are gladly buying railroad cars in the USSR to carry very hot coke. Several licenses have now been sold for this design in West Germany, France and India.

Soviet diesels, diesel generators, and diesel power plants are now operating in more than 60 countries in the world. They have proven themselves to be reliable and highly economical machines according to the response of representatives of business firms trading with us. Practically all models of engines are manufactured at our plants--from 8,000 to 21,000 HP, covering the entire range of capacities the consumer requires.

The Central Scientific Research Diesel Institute (TsNIDI) is the head organization in the branch for improvement of old models and creation of new models of diesel engines. Its specialists have developed a method of heat treatment of heavy fuel for economical and reliable operation of the diesel and have developed new methods of plasma strengthening of the operative surfaces of parts.

Jointly with organizations of Minkhimmash [Ministry of Chemical and Petroleum Machinebuilding] and Minelektrotekhprom [Ministry of Electrical Equipment Industry] the collective of the production association "Uralmash" has created a number of domestic drilling rigs for exploratory and production drilling of wells from 3,000 to 15,000 meters deep on land and offshore. The BU-3000 EUK drilling rig has been created for the petroleum workers in West Siberia for cluster drilling of wells from islands built with fill in the bogs of Tyumen (up to 16 wells per cluster). With these rigs the petroleum workers in Tyumen increased petroleum production about 50 percent over the period 1978-1981.

As of today the list of machines, units and pieces of equipment manufactured by the branch number more than 3,500 designations, including 700 which are consumer goods. They are being continuously updated. In just the 10th Five-Year Plan more than 100 new and modernized machines were put into production, and 275 models of outdated technology were withdrawn from production. The economic benefit of applying the new machines in the economy was 3.5 billion rubles. The relative share of products in the superior-quality category has more than doubled since the 10th Five-Year Plan and has reached 31.3 percent. The aim is to increase the relative share of products in the superior-quality category to 40 percent in the 11th Five-Year Plan.

This was preceded by a large preparatory effort by the engineering services of the plants and scientific research and design engineering organizations. Over the last 1.5 years standard technical documentation has been revised on all models of machines and the entire output--more than 1,500 technical specifications and almost all the standards. Indicators of durability, reliability, guaranteed service life between major overhauls, and also rates of consumption for lubricants and fuel have been revised in the new technical specifications. Specific metals intensiveness (along with machine weight) and specific energy intensiveness and labor intensiveness have been included in them as a mandatory indicator. The practical benefit of the new indicators lies in the fact that they take into account standard costs and costs over the entire operating life of machines; in other words, they show the economic efficiency of the operation of the machines in the economy.

Plans in the 11th Five-Year Plan call for putting more than 660 models of new equipment into production and for modernizing more than 200 machine models by increasing their output 1.5-2-fold over those manufactured in 1975 and modernizing about 150 machine models by doubling their operating life between major overhauls. Plans call for withdrawing from production 296 models of equipment of outdated designs. Economists have calculated that introduction of new technology created by the plants of Mintyazhmash in the 11th Five-Year Plan will afford the country a saving of 3 billion rubles, which in concrete terms will mean 1.8 million tons of metal, 475,000 tons of fuel and 157,000 tons of lubricants.

Equally urgent to the branch are the tasks of raising the technical level of production: mechanization and automation of the principal and auxiliary processes by means of computer and electronic equipment, introduction of fundamentally new technological processes, expansion of the stock of up-to-date metal-cutting equipment and machine tools with numeric programmed control.

Gravity die and centrifugal casting, progressive methods of plastic deformation, units for plasma cutting of metals and the spraying of powder coatings on the parts of machines and machinery are being introduced ever more widely at enterprises in the branch.

In order to improve machine quality and reliability and raise the profitability and reduce the cost of their production the ministry has planned over the period 1981-1985 to expand the scale of retooling and reconstruction of existing enterprises and introduction of progressive technology. Much attention has been paid to the use of low-waste technology, to the introduction of automated processes using industrial robots, to raising the level of mechanization and automation of labor, to reduction of heat losses, to use of secondary energy resources, to environmental protection, and to introduction of progressive space-layout and structural features. In the Basic Directions for Conservation of Metal, Fuel and Energy Resources and Optimum Utilization of Labor Resources in the Project Planning of Enterprises of Mintyazhmash Over the Period 1981-1985 and up to the Year 1990 specific instructions are given on economical consumption of metals and other materials and energy resources and for more optimum utilization of labor resources in the branch.

Measures aimed at improved use of capacity in the mechanical assembly and initial processing operations are scheduled for performance in the period 1982-1985. The most important direction for increasing the intensification of production--improved use of production capacities--will be accomplished by improving the structure of the stock of equipment installed, by introducing advanced technology, by raising the shift coefficient, and through other measures.

In initial processing the introduction of mechanized and automated flow lines, gravity die and centrifugal casting, casting from pig iron made in electric furnaces, the casting of products from metal powders, automated forging complexes, piece rolling mills, and plasma processes for electroslag melting will be expanded in the 11th Five-Year Plan. Provision has been made for full mechanization of 12 mechanical assembly shops and 211 mechanical assembly sections and lines. Full mechanization will be brought to 389 plantwide and shop warehouses, use of uniform and specialized containers for freight-handling and warehouse operations will be expanded up to 870,000 units, and 11 automated warehouses, 729 manipulators with compensated articulation, etc., will be introduced. Plans call for reducing the labor force by 60,000 and also for lowering the production cost of marketed output by 150.3 million rubles by raising the technical level of production and by improving production technology and the mechanization and automation of production in the 11th Five-Year Plan.

In 1982 progressive production processes and equipment and instruments for mechanization and automation were introduced in a planned way in the branch. One of the most important directions was to speed up the rate of full mechanization and automation of production processes involving reduction of manual labor in all technological phases. Accomplishments in 1982 include introduction of 24 automatic and semiautomatic production lines in initial processing, 13 automatic manipulators with programmed control in casting, forging and

pressing and welding, 23 automatic operators for galvanized coating shops, 51 technological installations for plasma cutting of metal and for spraying powder coatings on parts of machines and machinery, etc.

We should note the slow rate of introduction of robotics. It is well known that in technological processes and in certain operations robots must replace man or make his work easier, and this is true first of all in the lifting, movement and precision placement of heavy parts on machine tools, and also in stamping operations. At such enterprises as the production association "Zhdanovtyazhmash," the Riga Railroad Car Building Plant, etc., a large effort is being made to introduce robots and manipulators. The results of operation of automatic manipulators confirm the efficiency of their use.

But unfortunately project planning organizations are taking the simplest road in the introduction of robotics--the individual robot is being fitted in to the existing production process. The apparent simplicity of this method does not yield a large benefit; periods of time allowed for assimilation of the new technology are not met because production is continuing, and it is therefore difficult to do installation and adjustment work at the same time. In addition, operation is complicated because it is difficult for a single operator to attend several robots located in different spots in the production line.

It is far more promising to create separate robotized sections and shops. Though this requires radical restructuring, it greatly simplifies operation, makes it possible to increase the service zone, and affords greater opportunities for labor saving. There is no doubt that the future lies in the direction of using interrelated industrial robots rather than separate units.

The assignment to introduce industrial robots in our branch was doubled between 1981 and 1982. In coming years the extent of their introduction will increase considerably; plans call for making the transition from use of robots at individual work stations to their broad use, involving creation of robotized sections and lines and ultimately shops. Such measures have already been reflected in the program the ministry has adopted for creation and application of robotized complexes.

In 1982 17 computer and control complexes were put into operation, along with automatic process control systems in 3 production associations.

Efforts are being made in the branch to introduce processing equipment which will facilitate substantial metal conservation. Some constructive experience has been gained in this direction. The coefficient of utilization of rolled metal products is 0.79 in the branch as a whole and 0.88 and 0.81, respectively, in the subbranches of railroad car building and materials-handling machinebuilding. But still there is a certain overconsumption of metal in the 5-year period as a whole. As a rule this is occurring because of the failure to receive the economical sections of rolled products.

USSR Minchermet [Ministry of Ferrous Metallurgy] is on an annual basis organizing the production of no more than 15-17 percent of the new sections of

rolled products indispensable to the branch, and their actual delivery is still smaller. During the 10th Five-Year Plan enterprises of Mintyazhmash received only 43 of the 176 types and sizes of rolled products they required.

For the period 1982-1985 Mintyazhmash and USSR Minchermet signed a protocol for putting into production and delivering the necessary types of rolled products with improved quality and in the economical sections. But USSR Minchermet undertook to manufacture only 73,000 tons of rolled products instead of the planned 86,000 tons which moreover did not include all the necessary sections, which makes it necessary to seek out additional unused potential. The production of hollow car axles is being postponed to the end of the 5-year period; enterprises in the branch are not receiving economical sections for rolled driven pinions, the required sections for the axles of wheel pairs, the necessary steel sheet for railroad cars, etc.

Scientific research and design engineering organizations bear a great deal of responsibility for economical and thrifty consumption of physical resources. Most of them are having a substantial impact toward higher production efficiency and intensification of production, but by no means all staffs of scientific research, design engineering and process engineering organizations are applying themselves to the fullest, nor are they all coping with the task of creating highly productive and economical equipment which is convenient to operate and reliable in service. The ministry is called upon to be more rigorous in checking the effectiveness of new equipment.

The branch of heavy and transport machinebuilding is augmenting its economic potential every year; as the scale of production increases, the significance of every percentage point of resource conservation also increases. In the branch as a whole the relative share of material costs is 64 percent of the production cost, which makes it obvious that the effort for conservation and thrift under present conditions has paramount importance.

At the same time it is well known that more raw materials and energy are being spent in our industry per unit of the national income than in a comparison with the best world indicators. Nor is the branch of heavy and transport machinebuilding an exception. A number of designs of cranes, drill presses, diesel engines, ball mills and diesel locomotives need additional work in the direction of reducing the weight and metals intensiveness and the fuel consumption.

Utilization of resources is a concern not only of designers and process engineers, but also of economists. Mintyazhmash is constantly conducting an effort to revise standard allowances on consumption of materials for all types of products produced in the branch's associations and enterprises. The assignments for reduction of standard rates of consumption are broken down to all subdivisions. Ways and methods of saving raw materials and energy are fitted to the conditions of every enterprise. For instance, at the production association "Donetskgormash" and at the Yuzhnouralsk Machinebuilding Plant, the Barnaul Transport Machinebuilding Plant imeni V. I. Lenin, the Dnepropetrovsk Metallurgical Equipment Plant, and elsewhere this work is being done purposefully and is being stimulated with appropriate financial and

nonfinancial incentives. As a result material costs per ruble of commodity output are dropping constantly at the enterprises. For the ministry as a whole these costs dropped from 54.75 to 53.12 kopecks in comparable 1975 prices during the 10th Five-Year Plan.

Material incentives are expected to do the best job of mobilizing the potential for conservation. This will be furthered by the regulation drafted by USSR Gosplan on procedure and size of direct transfers to economic incentive funds for conservation of physical resources in the period 1983-1985. Direct transfers will be made to incentive funds according to a fixed scale from a portion of the saving achieved when material costs are brought below the established allowances. It is excellent that the proposed material incentive system will afford the possibility of awarding a sizable addition to the wage and at the same time substantially reduce the size of the bonus fund when work is poor and when the assigned allowance is exceeded. The methods of planning and the material incentive system must help to deepen the ties between science and production. As noted at the November (1982) Plenum of the CPSU Central Committee, those who make a bold move to apply new technology must not end up in a disadvantageous position.

In carrying out the decisions of the 26th CPSU Congress and subsequent plenums of the CPSU Central Committee, our branch is making a purposive effort to introduce in associations, enterprises and organizations all the propositions and principles of the decree of the CPSU Central Committee and USSR Council of Ministers entitled "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality." A number of the propositions envisaged by that decree have already been introduced into the practice of the conduct of economic activity by associations, enterprises and organizations subordinate to the ministry:

i. 5-year and annual plans are drafted according to the new system of indicators envisaged by the decree; the drafting of the plan begins from below, with the associations and enterprises;

ii. work is being done to create a system of quotas and allowances in order to raise the level of soundness of planning targets in the branch; as of 1 January 1980 passports had been drawn up for all associations and enterprises, and the sectorwide passport had been drafted for the period 1981-1985;

iii. the normative method has been introduced for planning wages, the unified fund for development of science and technology, economic incentive funds, and also the distribution of profit;

iv. physical units of measurement of output have been improved, the new indicators for planning the output of metallurgical equipment by assortment and in millions of rubles have been introduced in part;

v. the cost-accounting (khozraschet) system has been introduced for the planning, financing and stimulation of new technology in scientific research, design engineering, and process engineering organizations and at the branch's enterprises;

vi. the target-program method of planning is being used to speed up the creation of new technology;

vii. settlement with the state budget has been centralized;

viii. all subdivisions in the branch, including the ministry's staff, have made the transition to cost accounting;

ix. the system of material incentives and conditions for socialist competition have been brought into conformity with the indicators and new principles for the conduct of economic activity.

Every year the ministry is guaranteeing delivery of equipment to the most important of the country's economic projects which are near completion and for export by dates agreed on with consumers. Every year deliveries are being made of machines and equipment for agriculture and of durable consumer goods and housewares.

Thanks to introduction of the cost-accounting system of planning, financing and economic incentives of projects aimed at new technology in the branch, the time for creation and application of new technology has been reduced from 5 years to 4. Year after year there is an increase in the creation of new machines and machines put into production for the first time in the USSR. The interval for product renewal is 7 years. Specialists in work collectives are working to reduce that time.

Achievement of high production indicators is not possible unless progressive and scientifically sound forms of the organization of work are introduced. It has to be said that sociologists concerned with these problems are providing a great deal of help to practitioners in introducing the new forms of organization of work at enterprises. As for our branch, the principal work is being done here by the branchwide scientific management center in Kramatorsk. Specialists of the scientific management center not only summarize, analyze and disseminate the most up-to-date and progressive information on particular innovations in the field of the scientific organization of work, but they themselves are also developing and carrying out measures to introduce progressive forms of work at enterprises in the branch.

One of the most progressive forms of the organization of work is the introduction of attendance of more than one machine tool (more than one unit), which makes it possible to save manpower, to increase the coefficient for the shift operation of equipment, the intensity of work and labor productivity. Adoption of attendance of more than one machine tool (more than one unit) needs a solid scientific approach. There are cases in the branch of successful effort to introduce the attendance of more than one machine tool.

Work stations of persons attending more than one machine tool have been organized on a scientific basis in the transportation machinebuilding plant. Scientific management passports have been drafted for the work station; they clearly state the work process, give the layout of the work station, a diagram of the optimum location of things in the work zone, a list of the

technological and organizational gear supplied to the work station, and a chart of connections with auxiliary services. The procedure and method of manning the work station are set forth.

One valuable thing in this system is the drafting of new rates of remuneration for attending more than one machine tool: more accurately, standard inputs of labor have been established more accurately on a sound scientific foundation. When a study is made of operations as to whether it is possible to introduce the attendance of more than one machine tool, a calculation is made of the coefficient of effective work, which makes it possible to determine the authentic possibilities of each unit of equipment and in addition the possibility for effective work of the machine tool operator on that equipment. Thus the work of those attending more than one machine tool has begun to be evaluated more objectively and to be paid better.

In January 1981 the collegium of the ministry, jointly with the Presidium of the Central Committee of the Trade Union of Workers in Heavy Machinebuilding, took up the problems of the movement of persons attending more than one machine tool and outlined ways of solving them. A regulation on the operator of more than one machine tool was adopted. Now workers who have attended two or more machine tools for the last 10 years and who have been working at the respective enterprise for at least 15 years are awarded the title "Honorary Multiple Machine Tool Operator of the Ministry of Heavy and Transport Machinebuilding"; they are presented a certificate and paid an award.

One of the most important untapped sources of higher production efficiency is adoption of such a progressive form of the organization of work as the brigade system. In 1979 the decision was made to go further in the development of mixed brigades. In these brigades start-to-finish methods of operation are used, which instills in people a sense of responsibility for the end results of the work of the brigade, the shift or the section. Now more than half of the workers in the branch have become members of mixed brigades. The need for workers with vocational training has dropped by 3,700 persons in this period because of the introduction of the brigade form of the organization of work and remuneration.

A most important untapped potential for higher production efficiency is development of the progressive forms of socialist competition. The forms of competition used at our enterprises are rather diverse. One of them is competition among production brigades (sections) linked together by the same technological process. This competition is significant because it develops along the vertical technological chain and helps to guarantee the uniform pace of production, improvement of the quality of products produced, and fulfillment and overfulfillment of plans and obligations by related brigades.

An example of this is the competition organized in related shops of Uralmashzavod to manufacture parts for large-series machines in the chain: shape casting--trimming--machining--assembly shops. The agreements concluded among the subdivisions stipulated delivery times, the quality and number of parts to be transferred from one unit to the next. The quality of work of initial processing shops is determined during machining, and indicators of the uniform

pace of delivery of parts is determined in the finishing cycle in the assembly shop. Questions that arise of the quality and regularity of deliveries are quickly settled in conferences of supervisors of the production units which are the links in the chain.

The initiative of the collective of the production association "Uralmash" to develop competition among engineering and technical personnel on the basis of personal creative plans has become widespread at the enterprises of the branch. These plans reflect the activity of the specialist in developing and in improving production, in raising labor productivity and in improving product quality. The principal purpose of competition among the technologists of "Uralmash" is to seek out optimum ways of reducing the labor intensiveness of products. By improving the technology, the specialists are every year reducing labor inputs by 1,000 quota-hours or more. This is helping to make machine tool operators available and to save sizable amounts of physical resources.

Machinebuilders can and must also make a solid contribution to optimum use of physical and labor resources. Improvement of production, introduction of energy- and materials-saving and also waste-free technology, mechanization and automation of heavy and laborious operations, and many other things have great importance here.

The 11th Five-Year Plan is now entering its decisive stage. Its third year might be called the decisive year in the sense that fulfillment of the 5-year plan depends on successful performance this year. The machinebuilders face important and complicated tasks. The efficiency of operation of leading sectors of the economy depends on their successful performance. The work of the many thousands of people in the branch is aimed at their full completion ahead of schedule.

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COMPREHENSIVE PRODUCTION AUTOMATION DISCUSSED AT CONFERENCE

Leningrad LENINGRADSKAYA PRAVDA in Russian 25 Sep 83 p 1

[Unsigned LenTASS article: "Policy Aimed at Scientific-Technical Progress"]

[Text] The decisions of the 26th CPSU Congress and the decree of the party's Central Committee and the USSR Council of Ministers "Concerning Measures to Accelerate Scientific-Technical Progress in the National Economy" particularly single out the following as being one of the main directions: the task of automating scientific-research, planning-design and technological work and of creating flexible automatic production units on the basis of the broad application of computer equipment.

At the present time many branches of Leningrad industry are working out integrated production complexes, which have as their most important feature the complete automation of the "planning to production" process achieved by means of electronic computers. In recent years automated control systems have been created for a number of production units, as have models of automated manufacturing equipment, machine tools, robots and automatic transportation. Since the start of the current five-year plan more than 70 automated sectors and production lines have been equipped; about 900 robots and automatic operators and more than 1,000 machine tools with digital program control have been introduced.

On the eve of Machine-Builder's Day a conference was held in the Smol'nyy Institute; trends in the further development of the comprehensive automation of production were outlined at the conference.

The participants at the conference included officials from a number of enterprises, scientific-research and planning-design organizations, institutions of the USSR Academy of Sciences, higher educational institutions, and from the Leningrad Oblast and Leningrad City party committees.

At the conference it was noted that one of the important tasks is to shift from individual automation systems to integrated production complexes and flexible automatic production. The introduction of these systems provides for a significant accleration of the growth rate in labor productivity; it also provides for improvement in production effectiveness and output quality, a reduction in the proportion of manual labor and the release of labor resources, as well as a reduction in production space. Further, it is important to work toward an increase in the level of organization and discipline. The new type of automation is valuable primarily because it makes it possible to automate single-unit and small-scale production, which make up the bulk of Leningrad's machine building and instrument making.

The presentations emphasized that methods of group technology in the organization of production play a great role in the creation of integrated production complexes and flexible automatic production units. It was noted that there was a need to conduct as soon as possible a classification and grouping of parts at all the city's industrial enterprises in order to accelerate the introduction of group technology.

Information-computer sections constitute one of the main ways of making it possible to achieve in practice the target of complete automation of the "planning to production" process. In Leningrad people have acquired experience in the operation of collective-use computer centers and multi-process information management systems. At present the Leningrad Scientific-Research Computer Center of the USSR Academy of Sciences is actively conducting work on the establishment of a regional computer network.

Much attention has been devoted to the tasks of coordinating the efforts of enterprises and organizations on the establishment--including the establishment on a cooperative basis--of the software and hardware for integrated production complexes, on the manufacture of automatic equipment, storage facilities, robots, transportation and control-measuring devices. Also discussed were the tasks related to the expansion of training for specialist personnel to meet these goals, with the training to be carried out in Leningrad VUZ's, tekhnikums and vocational-technical institutions.

The task of the city and rayon party committees is to undertake strict monitoring of the entire work of creating integrated production complexes and flexible automatic production units, the efficient loading of electronic computer equipment for purposes of automating scientific investigations, planning-design and technological projects and the establishing of flexible automated production units. All this work must be aimed at fulfilling the plans and socialist obligations of Leningrad and the oblast. It is essential to consider these question when formulating plans

for technical progress in the current five-year plan period and in the longer range; this applies to the plans for enterprises in all branches of industry, construction and transportation. In this work a large role is given to the economic and social development councils of the CPSU gorkoms and raykoms.

The following people spoke at the conference: V.M. Ponomarev, director of the Leningrad Scientific-Research Computer Center of the USSR Academy of Sciences; V.M. Val'kov, director of the All-Union Elektronstandart Scientific Research Institute; G.V. Orlovskiy, department head at the All-Union Scientific Research Institute of Radio Equipment; D.M. Rostovtsev, rector of the Cable Building Institute; I.I. Sigov, director of the Institute of Socio-Economic Problems of the USSR Academy of Sciences and others.

L.N. Zaykov, first secretary of the Leningrad Party Obkom, made a speech at the conference.

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NEW BOOK DISCUSSES EXCHANGE OF TECHNOLOGICAL INFORMATION

Moscow MEZHDUNARODNYY OBMEN TEKHNOLOGICHESKIMI ZNANIYAMI in Russian Aug 81 (signed to press 17 Aug 81) pp 1-3, p 78

[Title page, annotation, introduction and table of contents from book "The International Exchange of Technological Knowledge" by V.A. Ryabov, "Mezhdunarodnyye otnosheniya", Moscow, 1981, 25,000 copies, 80 pages]

[Text] The role of scientific-technical knowledge and production experience in international economic ties is examined. The function which knowledge has in the labor process during the fulfillment of the work cycle, which includes scientific research, design, production and the sale of output, is shown. The international excange of knowledge; knowledge as a commodity; "know-how," what it is, how much it costs and what has to be done to sell it: those are the basic question treated in the book. Examples are cited from international licensing experience and the experience of Soviet enterprises and organizations.

> "There are three elements in the technical process: knowledge, energy and materials. The extent to which civilization can rule nature depends on these three elements. Knowledge is definitely the main one of these; without it the other two elements are useless."
>
> George Thomson

Introduction

The international exchange of scientific-technical achievements, technological knowledge and production experience acquires particular significance with the unfolding of the scientific-technical revolution, which is characterized by the transformation of science into a direct production force, by the acceleration of scientific-technical progress, by the strengthening of the social division of labor, by the qualitative transformation of the production forces, and by the concentration

and specialization of production. This exchange penetrates all forms of economic and scientific-technical ties among countries: scientific-technical cooperation; production cooperation and specialization, planning and construction of industrial facilities, scientific-technical assistance to the developing countries, etc. The Soviet Union and the other countries of the socialist alliance which have great scientific-technical and economic potential, and which firmly and consistently implement Leninist principles of peace and the development of mutually beneficial cooperation among countries, are participating actively in this worldwide process.

In the report of the CPSU Central Committee to the 26th party congress, L.I. Brezhnev, general secretary of the CPSU Central Committee described the significance of the development of foreign economic ties in the following way: "We see in foreign economic ties an effective means for contributing to the resolution of both political and economic tasks. The might and solidarity of the socialist countries' alliance are strengthened by means of economic integration. Cooperation with the developing countries facilitates the restructuring of their economies and social life on progressive foundations. Finally, economic and scientific-technical ties with the capitalist states strengthen and expand the material base of the policy of peaceful coexistence."

The decisions of the 25th CPSU Congress posed the following basic tasks in the area of the further development of foreign economic ties: "Provide for the further, all-around development of economic and scientific-technical ties with foreign countries by utilizing more fully the increased opportunities of the USSR's economy, science and technology.

"Carry out measures aimed at broader participation by the Soviet Union in the international division of labor, and at an increased role for foreign economic ties in the resolution of economic tasks and in the acceleration of scientific-technical progress."

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NEW PAMPHLET DISCUSSES ROLE OF SCIENTIFIC PROGRESS IN PRODUCTION

Moscow NTP I KHOZYAYSTVENNYY MEKHANIZM in Russian Apr 83 signed to press 12 Apr 83), pp 1, 64

[Title page, annotation and table of contents from pamphlet "Scientific-Technical Progress and the Economic Mechanism," (No 5, 1983 in the popular-science subscription series "Economics and the Organization of Production." New Things in Life, Science and Technology) by A.V. Bachurin, doctor of economic sciences, professor and deputy chairman of Gosplan SSR, Izdatel'stvo "Znaniye", Moscow, 1983, 34,030 copies, 64 pages]

[Text] This pamphlet contains an examination of scientific-technical progress as the main factor in the intensification of production and in the improvement of labor productivity. In this regard, the author devotes particular attention to ways to improve planning for science and technology, to improve the natural measuring indices of production quality and to manage the design and introduction of new equipment; these ways include the use of economic incentives.

The pamphlet is designed for lecturers and propagandists, for audiences at people's universities, for employees of planning organs and for employees dealing with economic matters.

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GEORGIAN SSR ACADEMY OF SCIENCES DISCUSSES TASKS OF SCIENTISTS

Tbilisi ZARYA VOSTOKA in Russian 5 Jul 83 p 3

/Report on meeting: "General Meeting of the Georgian SSR Academy of Sciences"/

/Text/ Opening it, Ye. Kharadze, president of the republic's Academy of Sciences, noted that the recently held June Plenum of the CPSU Central Committee and the speech by Yu. V. Andropov, general secretary of the CPSU Central Committee, chairman of the Presidium of the USSR Supreme Soviet, at it illuminated in a new way the role of the country's scientists in the solution of urgent national economic problems. A unified scientific and technical policy now acquires decisive importance. Vast work on the development of new machines and mechanisms, on production automation and on the development and extensive application of computers and robots in the national economy is ahead. This is one of the basic prerequisites for a fundamental rise in labor productivity. Acquisition of materials with preset properties, development of biotechnology and an extensive application of waste-free technology in industry are also on the agenda.

The efforts of the party and the people concentrate more and more on a planned and all-around improvement in the society of developed socialism. Scientists must take the most active part in this process.

E. Sekhniashvili, acting academician-secretary of the republic's Academy of Sciences, made the report "The 13th Plenum of the Central Committee of the Communist Party of Georgia and the Tasks of Georgian Scientists in the Light of Its Decisions."

"The 13th Plenum of the Central Committee of the Communist Party of Georgia," he said, "defined the tasks of party organizations concerning the further increase in the efficiency of utilization of raw material, fuel-power and other material resources in the light of the decisions of the November (1982) Plenum of the CPSU Central Committee and of the provisions and conclusions contained in Comrade Yu. V. Andropov's speeches. Georgian scientists should have their weighty say in the solution of these problems."

Research on more than 80 specific problems of improvement in industries and on a careful expenditure of materials unfolded in the academy's scientific institutions. Especially valuable research results were obtained by the specialists of the Institute of Metallurgy imeni 50-Letiya Obrazovaniya SSR,

the Institute of Mechanics of Machines, the Institute of Mining Mechanics imeni G. Tsulukidze, the Institute of Biochemistry of Plants, the Institute of Inorganic Chemistry and Electrochemistry, the Institute of Pharmacochemistry, the Institute of Construction Mechanics and Seismic Stability imeni K. Zavriyev, the Institute of Physical and Organic Chemistry imeni P. Melikishvili, sectors of hydrogeology and engineering geology of the Georgian SSR Academy of Sciences and so forth.

Such important problems as protection of metals against corrosion, development of new structural materials, powder metallurgy, development of efficient internal combustion engines, effective technology of extraction and processing of manganese ores, investigations and development of new biotechnological processes for the production of proteins, aminoacids, vitamins and glucose from food waste, development of natural zeolites and so forth are solved successfully.

Having described the advances in the work of institutes in detail, the speaker also pointed out unsolved problems. He noted that, when searching for methods of an efficient utilization of raw materials and material resources, one must not forget the efficient utilization of labor resources and improvement in the working conditions of the main productive force of society--the Soviet people. This problem has several aspects; in particular, scientific-technical, economic and social-moral aspects.

The academy's institutes still pay little attention to the development of methods and means of facilitating and reducing manual labor and of eliminating heavy physical labor. Meanwhile, in the republic specific work is carried out in this direction according to a special overall scientific and technical program. Nor is the work of the academy's institutes on the development of robot engineering and various manipulators and production automation and mechanization equipment sufficient.

A decree was adopted on the discussed matter.

Elections of the academician-secretary of the Georgian SSR Academy of Sciences, academicians-secretaries of departments and the corresponding member of the republic's Academy of Sciences were held.

E. Sekhniashvili, academician of the republic's Academy of Sciences, was elected academician-secretary of the Georgian SSR Academy of Sciences.

A. Apakidze, academician of the Georgian SSR Academy of Sciences, was elected academician-secretary of the department of social sciences and V. Gomelauri, academician of the Georgian SSR Academy of Sciences, academician-secretary of the department of applied mechanics and control processes.

Dzh. Lominadze, corresponding member of the Georgian SSR Academy of Sciences, was appointed acting academician-secretary of the department of mathematics and physics.

R. Adamiya, doctor of technical sciences, professor, was elected corresponding member of the Georgian SSR Academy of Sciences in the "dynamics and strength of machines" specialty (city of Kutaisi).

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